Environmental Report for the General Matter Paducah Enrichment Facility

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EXECUTIVE SUMMARY

General Matter, Inc. (GeM) is the applicant for a license from the United States (U.S.) Nuclear Regulatory Commission (NRC) to construct and operate a low-enriched uranium (LEU) and high-assay, low-enriched uranium (HALEU) enrichment facility (subsequently referred to as the General Matter Paducah Enrichment Facility [GMPEF]). The license would authorize GeM to possess and use special nuclear, source, and by-product material in the GMPEF. The National Environmental Policy Act (NEPA) of 1969 requires Federal agencies, as part of their decision-making process, to consider the environmental impacts of actions under their jurisdiction. The NRC has established regulations to implement NEPA requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51 (*Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions*). This Environmental Report (ER) is being submitted to the NRC by GeM to comply with the 10 CFR Part 51 requirements in support of the licensing of the GMPEF and is organized according to the guidance for applicants provided by the NRC in Nuclear Regulatory Commission Report (NUREG) 1748, *Environmental Review Guidance for Licensing Actions Associated with Nuclear Material Safety and Safeguards Programs* (NRC, 2003).

Proposed Action

The Proposed Action is to construct and operate the GMPEF on land at the existing U.S. Department of Energy (DOE) Paducah Site (former Paducah Gaseous Diffusion Plant [PGDP]) near Paducah, Kentucky, in accordance with the Atomic Energy Act of 1954, as amended; 10 CFR Part 70 (*Domestic Licensing of Special Nuclear Material*); and other applicable laws and regulations. It is GeM's intent that at the end of the GMPEF's operating life, the planned decommissioning activities would achieve release of the site for NRC license termination and unrestricted land use pursuant to 10 CFR 20.1401 (*General provisions and scope [Standards for Protection Against Radiation])* and 10 CFR 20.1402 (*Radiological criteria for unrestricted use [Standards for Protection Against Radiation]*).

The Proposed GMPEF would be situated on approximately 107 acres of land within the DOE Paducah Site. This tract of land (also referred to as "GeM Land Parcel" or "GMPEF Site") is located approximately 10 miles west of Paducah in McCracken County, Kentucky. The GeM Land Parcel is zoned for heavy industrial land use. Tree-clearing and rough grading activities have taken place on 70 acres of the approximately 107-acre site as discussed in the CX determination in *Site Preparation Including Tree Clearing (Parcel A) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (CX-270853) and *General Matter, Inc. Site Preparation (Parcel A) at the Paducah Gaseous Diffusion Plant, Kevil, McCracken, Kentucky* (451.1a-093), respectively. The Proposed Action would require tree clearing and rough grading of 6.8 acres of presently undeveloped forested land. The remaining 30 acres of the GMPEF Site were cleared and graded prior to GeM's lease and are now periodically mowed vegetation areas under the transmission line right-of-way.

The GeM Land Parcel contains high voltage electrical transmission lines and an existing uranium hexafluoride (UF_6) cylinder storage yard. Figure ES-1 shows the location of the GMPEF Site in relation to nearby cities, towns, landmarks, highways, rivers, and other waterbodies. The GMPEF Site is bordered by the DOE Paducah Site to the north, Hobbs Road to the west, and Dyke Road to the south and east. Surrounding properties are zoned for heavy industrial use.

Implementation of the Proposed Action would allow GeM to construct and operate a facility with the capability to enrich Depleted-up-to-Natural Uranium and produce both LEU (up to 5 percent uranium-235 [U-235]) and HALEU (up to 20 percent U-235). Feed material would include depleted, natural, and enriched UF_6. Natural uranium hexafluoride (NUF_6) would be transported to the GMPEF over public roads, and DUF_6 from the adjacent DOE Paducah Site would be transported on private roads or received directly

on site at the existing UF_6 cylinder storage yard. The GeM process separates U-235 (the fissile isotope) from uranium-238 in the uranium hexafluoride (UF_6) feed material and produces a UF_6 product stream enriched in U-235, and a by-product stream depleted in U-235 (referred to as UF_6 tails or DUF_6). The GMPEF will produce both enriched NUF_6 ($ENUF_6$) and enriched (LEU and HALEU) UF_6.

Within the 107-acre GMPEF Site there would be two enrichment halls (Production Hall A and B), one would be approximately 650,000 square feet and the other approximately 490,000 square feet. Other facilities would include several administrative and support buildings, a switchyard, parking lot, outdoor UF_6 cylinder storage pads[1], and maintained landscaped areas. In addition, access roads would be established, with potential options for connection to Hobbs or Dyke Road.

The GMPEF would need the following utility connections:

- Connection to existing electrical lines at the new GMPEF substation. [redacted] (Trade Secret / Confidential Commercial Information)
- Connection to the DOE plant's natural gas lines. Natural gas is supplied by Atmos Energy to the DOE Paducah Site.
- Connection to the DOE Paducah Site potable water supply lines along Hobbs Road for potable and fire protection water.
- Connection to the DOE Paducah Site sanitary sewer along Hobbs Road for sanitary effluent.

New aboveground electrical utility lines would connect to a proposed electrical substation located to the southeast corner of the Site near Dyke Road. The electrical substation would receive 161 kilovolt power and would distribute 34.5 kilovolt power to the GMPEF. The Proposed Action includes placement of new utility lines within existing utility corridors and/or clearings to the fullest extent practicable to minimize the need for additional land disturbance. The existing high voltage transmission lines that traverse the GMPEF Site will need to be relocated to allow for complete construction of the GMPEF. Approximately 15 structures, to include 0.7 miles of transmission infrastructure and three circuits, would be moved to the southern border of the GMPEF Site (see Figure A-5). Transmission line relocation will remain within the property boundary and is not expected to have additional impacts on ecological resources.

The GMPEF would use a combination of environmental control systems, treatment processes, monitoring programs, and work practices to protect worker and public health and the environment. Any gaseous releases from areas inside the main uranium enrichment buildings in which UF_6 is handled and processed would be captured and routed through a multi-stage air emission control system. Similarly, suspected liquid radiological wastewater would be collected in a closed, dedicated drain system connected to storage tanks. Radiologically contaminated water would be periodically sent off site for treatment and disposal. Sanitary wastewater would be sent to the DOE Paducah Site sanitary sewer system to be treated at the C-615 Sewage Treatment Plant and discharged to the Kentucky Pollutant Discharge Elimination System (KPDES) permitted Outfall 004 which then discharges through Outfall 008. Outfall 008 effluents discharge into Bayou Creek. Stormwater would be conveyed to the northwest and northeast corners of the GMPEF Site and would be discharged under a new KPDES permit, with outfalls discharging to Bayou Creek, and/or to Little Bayou Creek. Solid waste would be managed at the GMPEF according to applicable

[1] The licensing of Depleted-up-to-Natural UF_6 cylinder storage pads through the Commonwealth of Kentucky, to include the construction, operation, and eventual decommissioning has been evaluated in the *Environmental Assessment (EA) for General Matter's Site Preparation and Licensing Activities in Parcel A of the Paducah Site in McCracken County, KY* (DOE/EA-2327).

regulations and best management practices and would be shipped off site to licensed facilities for recycling, treatment, or disposal as appropriate for the waste type.

The enriched UF_6 produced at the GMPEF would be transported by truck to fuel manufacturing facilities, such as the ones in Wilmington, North Carolina; Columbia, South Carolina; and Richland, Washington, or other customers. The $ENUF_6$ produced would be [redacted] (Trade Secret / Confidential Commercial Information) at the GMPEF or sold to clients and shipped to other enrichment facilities. The DUF_6 produced from the natural enrichment process would be trucked to one of the DOE's DUF_6 conversion facilities at the DOE Paducah Site, or DOE Portsmouth Site in Portsmouth, Ohio, or to a commercial DUF_6 conversion facility, should one become available. Until shipped off site, DUF_6 will be stored on site at the GMPEF. The secondary DUF_6 produced from processing DUF_6 from the DOE Paducah Site may be returned to the DUF_6 conversion facility [until it is decommissioned]. Low-level radioactive waste (LLRW) generated by GMPEF operations and requiring offsite disposal would be shipped by truck to the Waste Control Specialists disposal facility in Andrews County, Texas, the Energy*Solutions* disposal facility in Clive, Utah, or another licensed LLRW disposal facility.

Need for Proposed Action

The Proposed Action is intended to satisfy the need for domestic uranium-enrichment capacity for national energy security and to further establish advanced and diversified uranium enrichment technology in the United States.

Actual and projected increases in U.S. nuclear power generating capacity indicate an increasing national demand for uranium-enrichment services. Today, the U.S. has a significant domestic uranium enrichment capacity deficit compared to demand. This deficit was highlighted by the Russian invasion of Ukraine. Until recently, Russia supplied approximately 20 percent of U.S. enrichment requirements. Congress passed into law a full ban of Russian imports beginning in 2028, through December 31, 2040. Existing U.S. enrichment capacity and those from Western allies are not able to provide a dependable and economic source of supply for the current operating fleet. With U.S. government targets to expand nuclear energy capacity from around 100 gigawatts today to 400 gigawatts by 2050, the Nation requires new sources of enrichment services. Congress recognized the urgency of this issue by appropriating $2.7 billion in Fiscal Year 2024 to fund new enrichment capacity and DOE created an LEU and HALEU Acquisition Program, with GeM selected as one of the awardees, to deploy new domestic enrichment capacity. The Proposed Action is intended to satisfy the need for additional reliable and economical domestic sources of enriched uranium supply, particularly as previously available Russian sources of enriched uranium will no longer be available, and the Nation and our allies look to expand nuclear generation. The Proposed Action also aligns with and supports DOE's legacy management of DUF_6 by turning this material into an asset supporting commercial nuclear fuel needs. By supplying enrichment services to commercial nuclear fuel manufacturing plants, the GMPEF would support the operation of existing and proposed nuclear power plants. Further, by utilizing legacy DUF_6, the GMPEF plant is turning a stranded liability into an asset.

Consideration of Alternatives to the Proposed Action

There are currently three types of enrichment technologies: gaseous diffusion, gas centrifuge, and laser enrichment. (Trade Secret / Confidential Commercial Information)

[redacted]

[redacted]

(Trade Secret / Confidential Commercial Information)

As part of the lease signed in 2025, GeM entered into an agreement with DOE to assume responsibility of 7,600 cylinders of UF_6 stored at the Paducah Site. A site-selection process was performed to evaluate sites to identify the preferred site for the construction and operation of the GMPEF. The results of the site-selection process concluded that the GeM Land Parcel is the preferred site because it is a contiguous tract of developed land with sufficient acreage to accommodate the GMPEF and is less susceptible to adverse environmental impacts than other available areas. Additionally, siting the GMPEF on the DOE Paducah Site reduces the need for uranium transportation on public roadways.

Environmental Impacts of the Proposed Action

Under the No Action Alternative, the Proposed Action would not take place. The No Action Alternative therefore establishes the baseline for assessing the environmental impacts of the Proposed Action. This Environmental Report uses the standard of significance established by the NRC in NUREG.1748 to define environmental impacts. Environmental impacts are considered to be SMALL if they are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of an applicable environmental resource. Environmental impacts are considered to be MODERATE if they are sufficient to alter noticeably, but not to destabilize, important attributes of a resource. Environmental impacts are considered to be LARGE if they are clearly noticeable and are sufficient to destabilize important attributes of a resource.

The environmental impacts of the No Action Alternative would be SMALL, as the Proposed Action wouldn't take place under this scenario.

The types and magnitudes of environmental impacts for the Proposed Action would vary during the GMPEF's construction, operation, and decontamination and decommissioning. In general, unavoidable adverse impacts for the Proposed Action would be SMALL after mitigation, with the exception of MODERATE impacts for transportation, soils, surface water resources, ecological resources, visual resources, and waste management. Many of these impacts would occur on a localized or temporary basis (i.e., at or in the immediate vicinity of the GMPEF or only during the 2-year construction period). Even without mitigation, no LARGE adverse environmental impacts are identified for the Proposed Action. The MODERATE impacts are briefly described below.

Increased traffic during construction and operation of the GMPEF could have some adverse impact on the traffic flow and increase the potential for traffic congestion at the Hobbs Road and U.S. Highway 60 intersection during peak commuting hours. Therefore, transportation impacts for construction and operation of the GMPEF on a local basis are anticipated to be MODERATE.

Consistent with standard industrial development practices, rough grading activities have taken place on approximately 100 acres of the approximately 107-acre site as analyzed in the categorical exclusion (CX) determination in the CX for *General Matter, Inc. Site Preparation (Parcel A) at the Paducah Gaseous Diffusion Plant, Kevil, McCracken, Kentucky* (451.1a-093). Remaining grading within the GMPEF Site would begin with the removal of topsoil. Because soils would be stripped from much of the site, and because large soil volumes may be imported to or exported from the site, impacts on soils resulting from construction activities are expected to be MODERATE.

Current drainage from the GMPEF Site splits flow, draining east to Little Bayou Creek and its unnamed tributaries and west to Bayou Creek. Vegetation removal, grading, and other land-disturbing activities are likely to increase sediment loadings to receiving streams during construction. As such, GeM has obtained a KPDES stormwater construction general permit for two additional outfalls to Bayou Creek and Little Bayou Creek. Additionally, a Storm Water Pollution Prevention Plan would be produced. Impacts would be minimized with the implementation of surface water runoff and erosion control measures required by the KPDES stormwater construction general permit and the prevention plan. Impacts on surface water quality are anticipated to be MODERATE but temporary during GMPEF construction.

The conversion of undeveloped land to developed land due to construction of the GMPEF would noticeably alter the composition of habitat within the GMPEF Site but would not destabilize the existence of these communities off site; therefore, direct and indirect impacts to existing vegetation and wildlife on site would be MODERATE. Construction of the GMPEF would not alter the composition of wetland habitat within the GMPEF Site and would not destabilize the existence of wetland communities off site; therefore, impacts to wetlands would be considered MODERATE.

Temporary visual intrusions into the landscape would result from the use of 300-foot tall construction cranes at the GMPEF Site for erecting building structures and installing equipment during the 2-year construction period. Therefore, the visual/scenic resource impacts resulting from construction for the GMPEF would be MODERATE but temporary to offsite receptors.

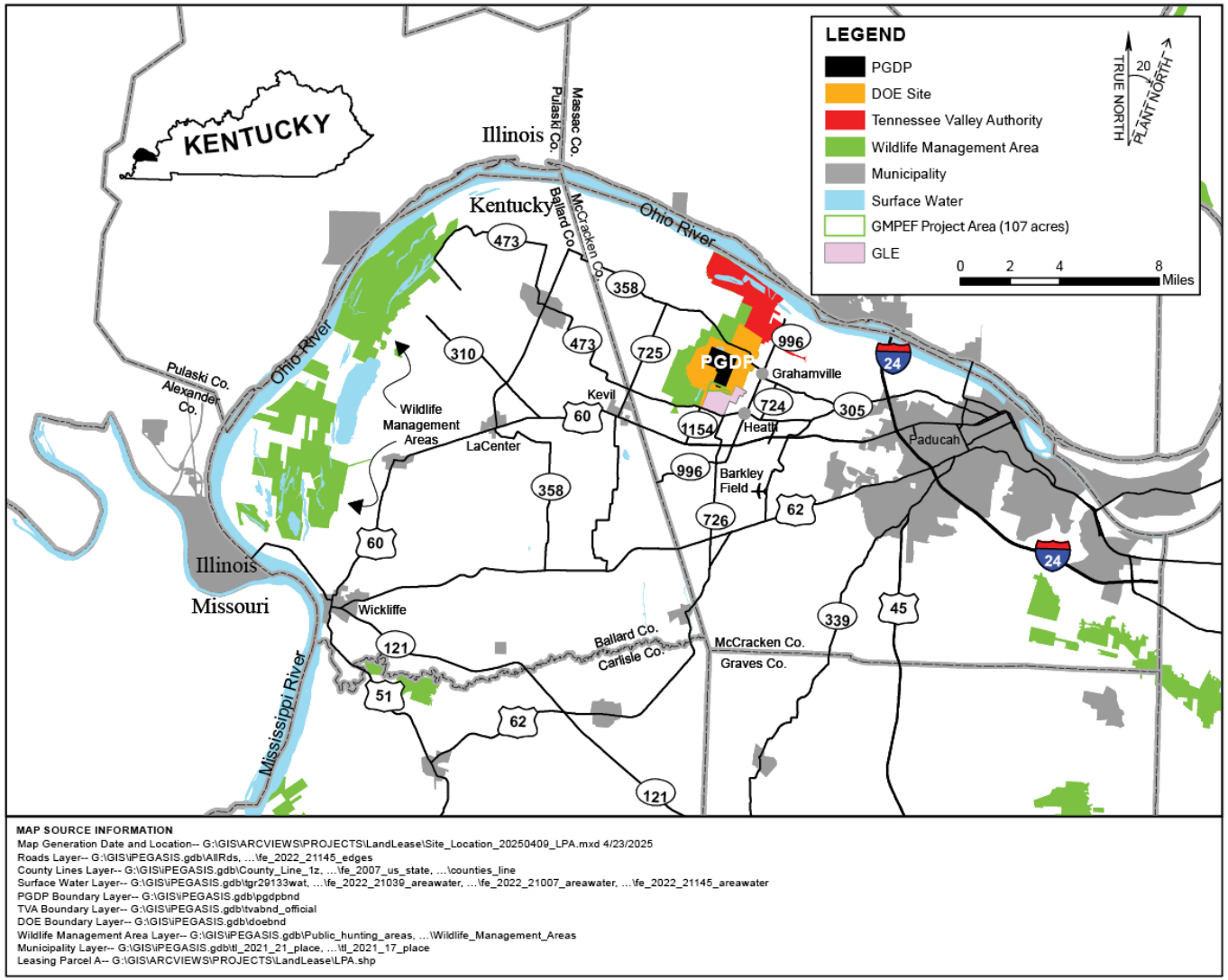
Cost-Benefits of the Proposed Action

The estimated adverse environmental and socioeconomic costs of the GMPEF are generally SMALL to MODERATE. MODERATE impacts are possible for land use, transportation, soils, surface water resources, ecological resources, visual resources, and waste management. Many of the adverse impacts would be short term and could be reduced by mitigation measures.

Anticipated benefits of the GMPEF include socioeconomic benefits and energy security benefits. Additional jobs and spending in the regional economy are regarded as financial benefits. Similarly, additional income tax and sales tax revenues received by Federal, State, and local governments as a result of the Proposed Action are also socioeconomic benefits. Other benefits of the Proposed Action include increased energy security due to increased quantity and reliability of the supply of enriched uranium. In addition, the GMPEF would provide enriched uranium to nuclear reactor fuel suppliers for existing and new U.S. commercial nuclear power plants. Commercial nuclear power plants generate electricity without emitting the air pollutants associated with fossil fuel-related power generation.

Conclusion

The Proposed Action is to construct and operate a facility at the GMPEF Site that would [redacted] (Trade Secret / Confidential Commercial Information) enrich uranium for use by nuclear reactor fuel fabrication facilities. The licensing of the GMPEF is an important step toward advancing the national energy security goals of maintaining a reliable and economical domestic source of enriched uranium. The construction, operation, and decommissioning of the GMPEF would have SMALL to MODERATE adverse impacts on the environment. Many of the adverse impacts would be short term and could be reduced by mitigation measures. Anticipated benefits of the GMPEF include socioeconomic benefits including jobs and spending, additional income tax and sales tax revenue, and increased energy security due to the increased quantity and reliability of the supply of enriched uranium to feed commercial nuclear power plants that generate electricity without emitting the air pollutants associated with fossil fuel-related power generation.



Source: (DOE, 2025a)

Figure ES-1: General Matter Paducah Enrichment Facility Site Location and Vicinity

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Appendix C **Historic Chemical and Radiological Sample Results for Parcel A** **C-1**

List of Acronyms and Abbreviations

§	Section
°F	degrees Fahrenheit
µCi	microcurie
µg/m^3	micrograms per cubic meter
AADT	Average Annual Daily Traffic
ACP	American Centrifuge Plant
ACS	American Community Survey
ADT	Average Daily Traffic
AIP	Agreement in Principle
ALARA	As Low as Reasonably Achievable
ANSI	American National Standards Institute
APE	Area of Potential Effect
ARF	atmospheric release fraction
ASER	Annual Site Environmental Report
AVLIS	Vapor Laser Isotope Separation
BCC	Birds of Conservation Concern
BCR	Bird Conservation Region
bgs	below ground surface
BLM	Bureau of Land Management
BMP	best management practice
bpf	blows per foot
Bq	becquerels
CAA	Clean Air Act
CAB	controlled area boundary
CBG	Census Block Group
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CRMP	Cultural Resource Management Plan
CWA	Clean Water Act
CX	Categorical Exclusion
D&D	decontamination and decommissioning
dB	decibels
dBA	A-weighted decibel
DOE	United States Department of Energy
DOT	United States Department of Transportation
DU	depleted uranium
DUF_6	depleted uranium hexafluoride
EA	Environmental Assessment
EIS	Environmental Impact Statement
$ENUF_6$	enriched natural uranium hexafluoride
EPA	Environmental Protection Agency
ER	Environmental Report
ESA	Endangered Species Act
F_A	annual facility-related dose

FAFC	Fluorspar Area Fault Complex
FEIS	Final Environmental Impact Statement
FFA	Federal Facility Agreement
F_Q	quarterly facility-related dose
FTA	United States Federal Transit Administration
FY	Fiscal Year
GEIS	Generic Environmental Impact Statement
GeM	General Matter, Inc.
GHG	greenhouse gas
GLE	Global Laser Enrichment, LLC
GMPEF	General Matter Paducah Enrichment Facility
GNF-A	Global Nuclear Fuels-America, LLC
gpd	gallons per day
GPED	Greater Paducah Economic Development
gpy	gallons per year
HALEU	high-assay, low-enriched uranium
HAP	hazardous air pollutant
HEPA	high-efficiency particulate air
HF	hydrogen fluoride
HF/m^3	hydrogen fluoride per cubic meter
HVAC	heating, ventilation, and air-conditioning
Hz	hertz
I-	Interstate
ID	Identifier
IEA	International Energy Agency
IF	Isolated Find
IHS	Industrial Hygiene and Safety
ISA	Integrated Safety Analysis
KAR	Kentucky Administrative Regulation
KDAQ	Kentucky Department for Environmental Protection Division for Air Quality
KDEP	Kentucky Department of Environmental Protection
KDFWR	Kentucky Department of Fish and Wildlife Resources
KDOW	Kentucky Division of Water
KDWM	Kentucky Division of Waste Management
KEEC	Kentucky Energy and Environment Cabinet
kgU/yr	kilograms of uranium per year
KHC	Kentucky Heritage Council
KNP	Office of Kentucky Nature Preserves
KPDES	Kentucky Pollutant Discharge Elimination System
KOP	key observation point
kV	kilovolt
KY	Kentucky
KY-	Kentucky Route
KYTC	Kentucky Transportation Cabinet
L_{dn}	day-night average sound level
L_{eq}	equivalent-continuous sound level
LES	Louisiana Energy Services, L.P.
LEU	low-enriched uranium

LLEA	Local Law Enforcement Agency
LLRW	low-level radioactive waste
LOS	Level of Service
MBq	megabecquerel
MBTA	Migratory Bird Treaty Act
MEI	maximally exposed individual
mg	milligrams
mg/L	milligrams per liter
mg U/m^3	milligrams of uranium per cubic meter
MH	Heavy Industry Zone
MLIS	Molecular Laser Isotope Separation
mrem	millirem(s)
MSA	Metropolitan Statistical Area
mSv	millisieverts
MSW	municipal solid waste
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NEF	National Enrichment Facility
ng/L	nanograms per liter
NHPA	National Historic Preservation Act
NMSZ	New Madrid Seismic Zone
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRC	United States Nuclear Regulatory Commission
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NUF_6	natural uranium hexafluoride
NUREG	Nuclear Regulatory Commission Report
O_3	ozone
OSHA	Occupational Safety and Health Administration
PADD	Purchase Area Development District
PAH	Barkley Regional Airport
Pb	lead
PCB	polychlorinated biphenyl
pCi/L	picocuries per liter
PFAS	per- and polyfluoroalkyl substances
PGDP	Paducah Gaseous Diffusion Plant
PLEF	Paducah Laser Enrichment Facility
PM	particulate matter
PM_{10}	particulate matter with diameters less than 10 micrometers
$PM_{2.5}$	particulate matter with diameters less than 2.5 micrometers
PPE	personal protection equipment
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
rem	roentgen equivalent man
RG	Regulatory Guide
RGA	Regional Gravel Aquifer

RHB	Radiation Health Branch
ROI	region of influence
ROW	right-of-way
SEIS	Supplemental Environmental Impact Statement
SHPO	State Historic Preservation Officer
SILEX	Separation of Isotopes by Laser Excitation
SO_2	sulfur dioxide
STP	Sewage Treatment Plant
Sv	Sievert
SWMU	solid waste management unit
SWPPP	Storm Water Pollution Prevention Plan
SWU	Separative Work Unit
Tc-99	technetium-99
TCE	trichloroethene
TEDE	total effective dose equivalent
TMDL	total maximum daily load
TSSs	Total Suspended Solids
U_3O_8	triuranium octoxide
U.S.	United States
U.S.C.	United States Code
U-235	uranium-235
U-238	uranium-238
UBC	Uranium Byproduct Cylinder
UF_6	uranium hexafluoride
UO_2F_2	uranyl fluoride
U.S. Hwy	United States Highway
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEC	United States Enrichment Corporation
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VdB	decibels of vibration velocity
VOCs	volatile organic compounds
VRMS	Visual Resources Management System
WCS	Waste Control Specialists
WKWMA	West Kentucky Wildlife Management Area
WNA	World Nuclear Association
WOTUS	Waters of the United States
WQC	Water Quality Certification
µg/kg	micrograms per kilogram

1.0 INTRODUCTION

General Matter, Inc. (GeM) is the applicant for a license to construct and operate a uranium enrichment facility. This license would authorize GeM to possess and use special nuclear, source, and by-product material at the General Matter Paducah Enrichment Facility (GMPEF). As required by Title 10 *Code of Federal Regulations* (CFR) Part 51, *Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions*, this Environmental Report (ER) is being submitted to the United States (U.S.) Nuclear Regulatory Commission (NRC) by GeM to support the licensing of the proposed GMPEF in accordance with the Atomic Energy Act of 1954, as amended; 10 CFR Part 70, *Domestic Licensing of Special Nuclear Material*, and other applicable laws and regulations (see Section 1.5, *Applicable Regulatory Requirements, Permits, and Required Consultations*).

GeM is a private U.S.-based company that was formed in 2024 to develop and commercialize a uranium enrichment capability in the United States. The GMPEF is an important step toward advancing the national energy security goals of maintaining a reliable and economical domestic source of enriched uranium. The Proposed Action is the issuance by the NRC of a license that would authorize GeM to possess and use special nuclear material, source material, and byproduct material at the GMPEF, a [redacted] (Trade Secret / Confidential Commercial Information) uranium enrichment facility, on land leased from the U.S. Department of Energy (DOE) Paducah Site (formerly the Paducah Gaseous Diffusion Plant [PGDP]) near Paducah, Kentucky (GeM and DOE, 2025).

This ER is organized in accordance with the guidance contained in Nuclear Regulatory Commission Report (NUREG)-1748, *Environmental Review Guidance for Licensing Actions Associated with NMSS Programs* (NRC, 2003). This chapter provides an introduction and discusses why GeM is requesting the license. Chapter 2.0, *Alternatives*, discusses the Proposed Action and Alternatives, including the No Action Alternative and siting alternatives. Chapter 3.0, *Description of Affected Environment*, describes the existing environmental conditions at the GMPEF Site, and Chapter 4.0, *Environmental Impacts*,[2] describes how those conditions would be affected, if at all, by the Proposed Action. Chapter 5.0, *Mitigation Measures*, discusses proposed mitigation measures that GeM may implement to mitigate potential environmental impacts of the Proposed Action. Chapter 6.0, *Environmental Measurements and Monitoring Programs* describes the environmental measurement and monitoring programs that GeM would establish for the GMPEF. Chapter 7.0, *Cost-Benefit Analysis*, summarizes the cost-benefit analysis for the GMPEF. Chapter 8.0, *Summary of Environmental Consequences*, summarizes the potential environmental consequences of the Proposed Action. Chapter 9.0, *List of References*, and Chapter 10.0, *List of Preparers*, lists the references for and preparers of this ER.

1.1 Background

The site proposed for the GMPEF is situated on approximately 107 acres of land leased from the DOE Paducah Site. This site includes the entirety of Leasing Parcel A (approximately 100 acres) and 6.8 acres of Leasing Parcel C (188 acres). A Categorical Exclusion (CX) was issued on July 3, 2025, for *the Lease of Real Property (Leasing Parcel A) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (CX-270990).* This CX evaluated the action of leasing 100 acres of real property of the PGDP to GeM. GeM is currently in negotiations with DOE- Portsmouth/Paducah Project Office for the lease of Leasing Parcel C, the real property transfer of which was evaluated in the *Lease of Real Property (Leasing Parcel C) at the Paducah Gaseous Diffusion Plant (CX-270955).*

[2] In this ER, "environmental impacts" and "environmental consequences" are used interchangeably.

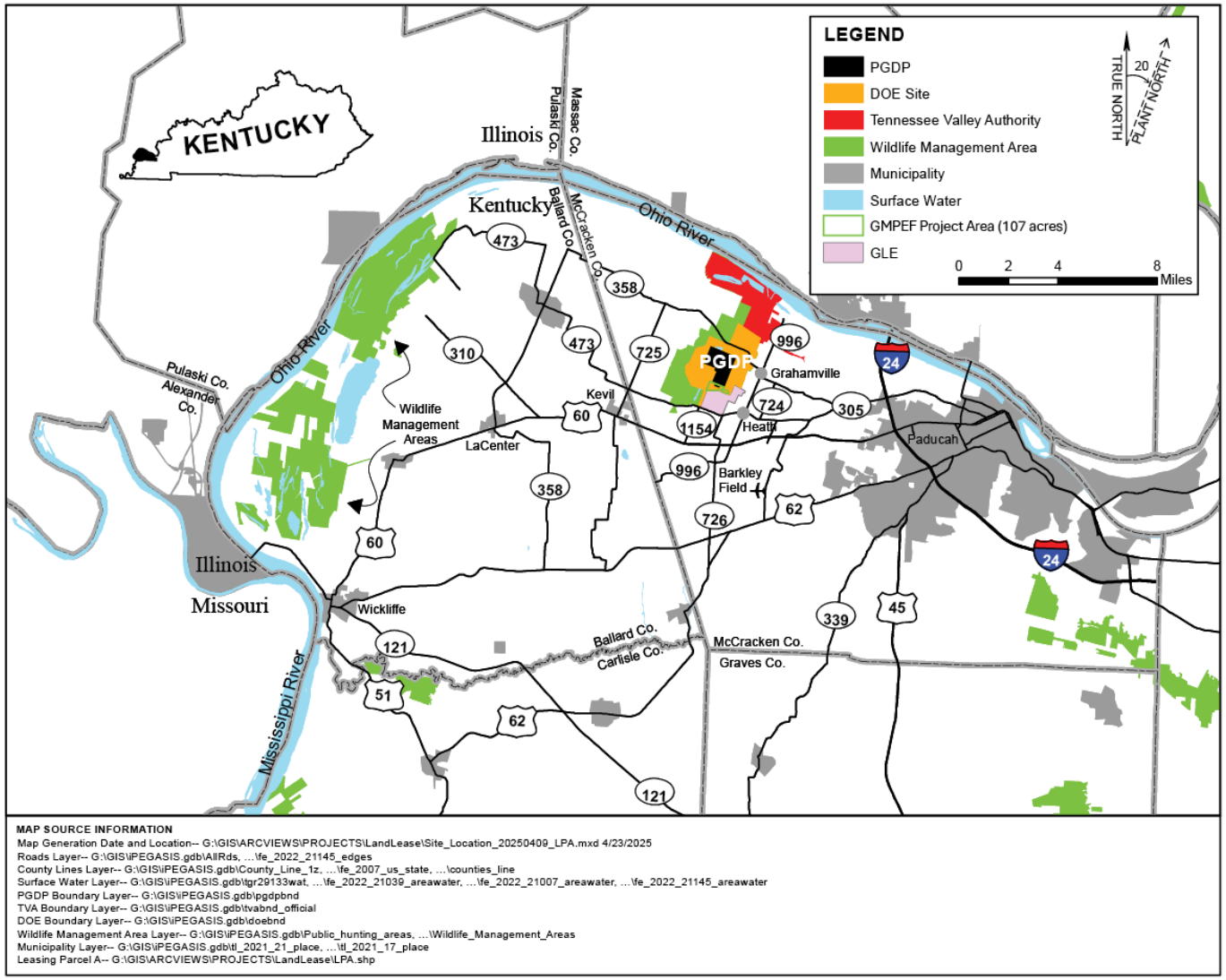
These tracts of land will be referred to as the GeM Land Parcel or GMPEF Site throughout the remainder of this document. The GeM Land Parcel spans between latitudes (North) 37° 5' 48.9" and 37° 6' 13.8", and between longitudes (West) 88° 49' 10.9" and 88° 48' 20.5", and is located approximately 10 miles west of Paducah in McCracken County, Kentucky (Figure 1-1). The GeM Land Parcel (Figure 1-2) contains an approximately 10-acre uranium hexafluoride (UF_6) cylinder storage yard (C-745-T Cylinder Storage Yard), a high voltage transmission line right-of-way, and is bordered by the following:

- North: The industrial core of the Paducah Site. A depleted uranium hexafluoride (DUF_6) conversion facility operated by Mission Conversion Services Alliance, LLC, is also located on the Paducah Site.
- East: Dyke Road. East of Dyke Road is a forest area of the DOE Paducah Site that was previously utilized as part of the West Kentucky Wildlife Management Area (WKWMA). Following recent land transfers, future use of the area would include industrial uses.
- South: Dyke Road. South of Dyke Road is approximately 691 acres of property owned by Global Laser Enrichment, LLC (GLE). GLE plans to construct and operate the Paducah Laser Enrichment Facility (PLEF) at this location. This area consists of forested and former agricultural fields that were formerly part of the WKWMA.
- West: Hobbs Road is a potential option for an access road to the Paducah Site. West of Hobbs Road is a portion of the DOE Paducah Site that consists of mostly forested land that was previously licensed to Kentucky as part of the WKWMA. Following recent land transfers, future use of the area would include industrial uses.

As described in *Leasing Data Package for Leasing Parcel A, Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE, 2025a), the Paducah Site includes the former PGDP, which is an inactive uranium enrichment facility owned by DOE. The Paducah Site is on a 3,556-acre Federal reservation in a rural area of McCracken County, Kentucky, approximately 10 miles west of Paducah, and 3.5 miles south of the Ohio River (Figure 1-1). The former PGDP occupies approximately 615 acres within a fenced industrial area (referred to as the "Limited Area") at the Paducah Site. From 1952 until 2013, PGDP enriched uranium for DOE and DOE predecessor agencies, the military, and commercial customers. The Energy Policy Act of 1992 (42 United States Code [U.S.C.] Section [§] 13201) privatized uranium enrichment, and operational responsibility for PGDP was transferred to the U.S. Enrichment Corporation in 1993. The Paducah Site was added to the U.S. Environmental Protection Agency (EPA) Superfund National Priorities List in May 1994. The U.S. Enrichment Corporation ceased operations in May 2013 and returned the leased facilities to DOE in October 2014. Although uranium enrichment has ceased, DOE maintains several missions at the Paducah Site. These missions include environmental monitoring and surveillance to ensure protection of site personnel, the environment, and the community; conversion of DUF_6 to an oxide; and deactivation of uranium enrichment facilities to prepare for decontamination, decommissioning, and/or demolition. With the cessation of enrichment operations, DOE is reconfiguring the site footprint, reducing the costs of maintaining the site, and facilitating beneficial reuse of DOE property by the community to support economic development (DOE, 2025a).

The GeM Land Parcel is approximately 6 miles from the Honeywell Metropolis Works Plant, which is a UF_6 processing facility located northwest of Metropolis, Illinois. The plant converts milled uranium oxide, "yellow cake" uranium, to gaseous UF_6 that can be enriched and then fabricated to produce nuclear fuel (GLE, 2025; NRC, 2013a). The plant was built in 1958 and is the only UF_6 conversion facility in the United States. The facility was shut down due to the potential for the facility to release UF_6 related to a credible seismic or tornado event, but in 2013, the NRC determined that the facility could resume all NRC licensed activities after Honeywell enhanced equipment to meet NRC requirements (GLE, 2025; NRC, 2013a). Honeywell announced a temporary suspension of UF_6 production due to business challenges in 2017.

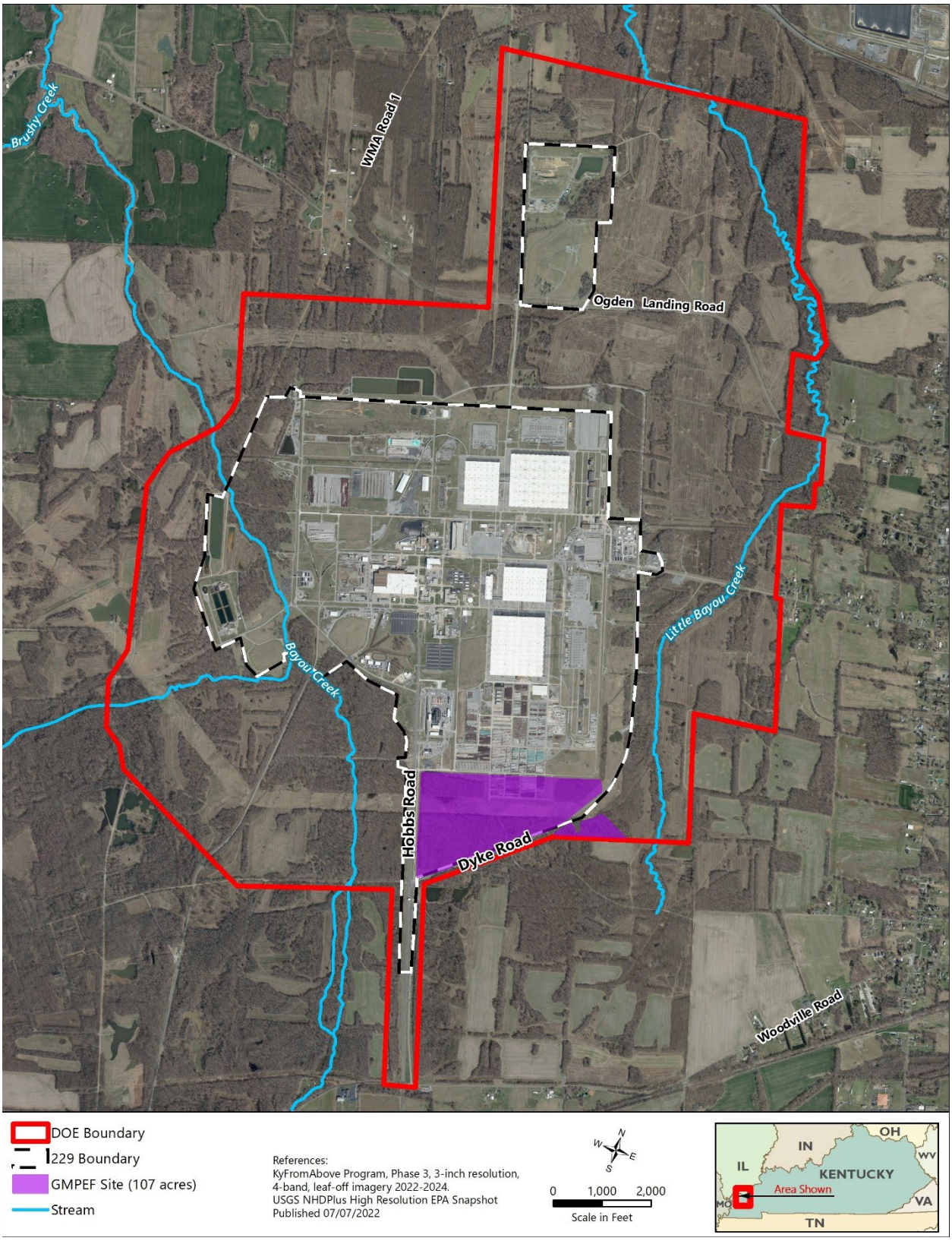
However, after renewing all NRC licenses through 2060, Honeywell successfully restarted operations in July 2023 (https://converdyn.com/facility/).



MAP SOURCE INFORMATION
Map Generation Date and Location-- G:\GIS\ARCVIEWS\PROJECTS\LandLease\Site_Location_20250409_LPA.mxd 4/23/2025
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DOE Boundary Layer-- G:\GIS\PEGASIS.gdb\doebnd
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Municipality Layer-- G:\GIS\PEGASIS.gdb\tl_2021_21_place, ...\tl_2021_17_place
Leasing Parcel A-- G:\GIS\ARCVIEWS\PROJECTS\LandLease\LPA.shp

Source: DOE (2025a)

Figure 1-1: General Matter Paducah Enrichment Facility Site Location



Source: DOE (2025a)

Figure 1-2: General Matter Paducah Enrichment Facility Site

1.1.1 General Matter Technology

[redacted] (Trade Secret / Confidential Commercial Information)

1.1.2 The General Matter Study Area and the General Matter Paducah Enrichment Facility Site

GeM performed a siting study for the GMPEF that evaluated 30 sites across the United States. The siting study determined that the most attractive site for the GMPEF would be at the DOE Paducah Site near Paducah, Kentucky. DOE and GeM evaluated locations at the DOE Paducah Site and determined that the area on the southern side of the Paducah Site would be the most promising. The site-selection process is described in more detail in Chapter 2.0, *Alternatives* (see Section 2.2.3, *Elimination of Site Alternatives*).

Within the 107-acre GMPEF Site there would be two enrichment halls (Production Halls A and B), one would be approximately 650,000 square feet and the other approximately 490,000 square feet. These production halls would be capable of enriching Depleted-up-to-Natural UF_6 into low-enriched uranium (LEU), and LEU into high-assay, low-enriched uranium (HALEU). A preliminary site plan is included on Figure 1-3. A conceptual rendering is included on Figure 1-4.

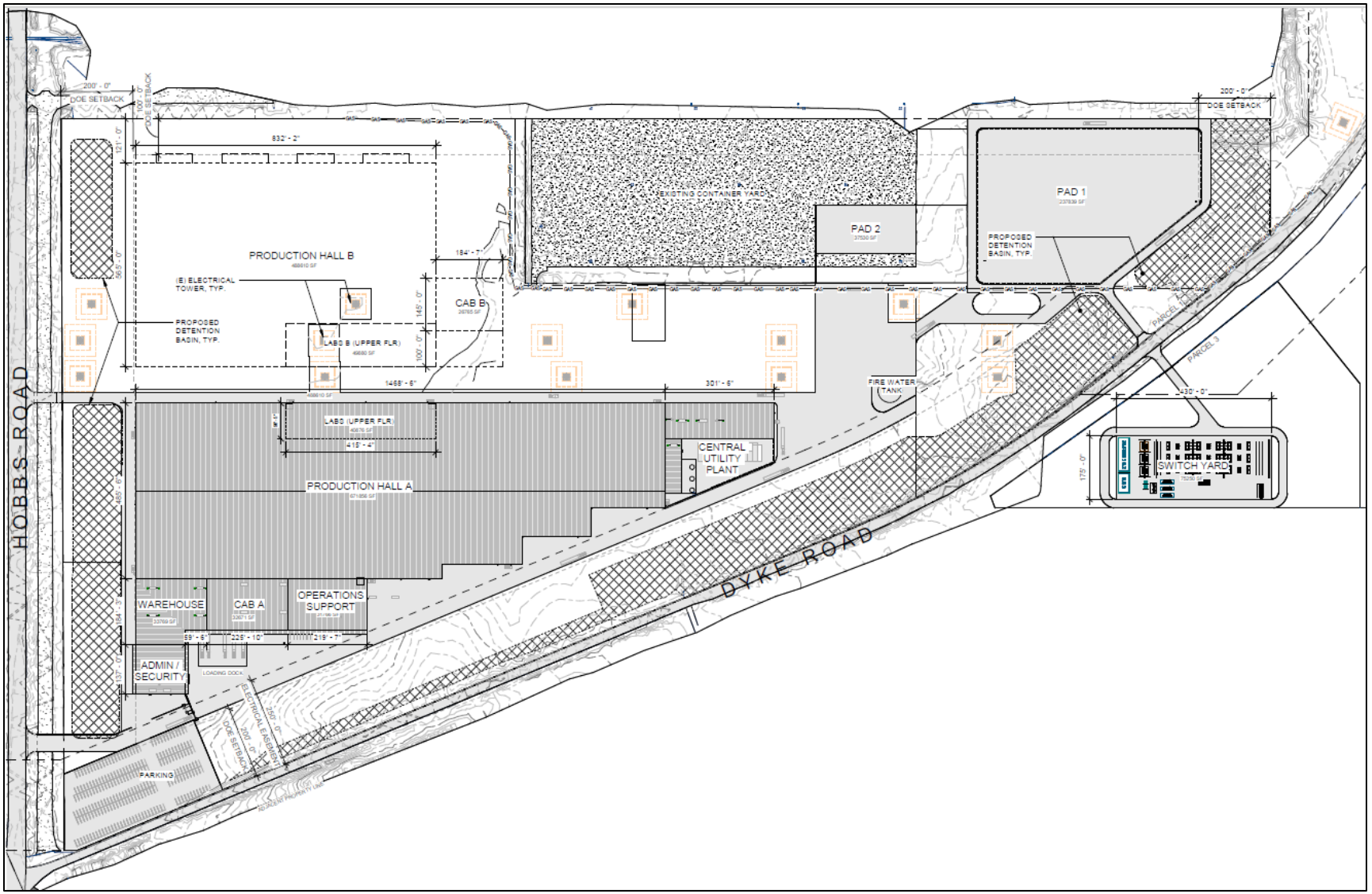


Figure 1-3: General Matter Paducah Enrichment Facility Conceptual Site Plan



Figure 1-4: Rendering of Facilities at the General Matter Paducah Enrichment Facility Site

1.1.3 Existing NEPA Documentation for Site Preparation Activities at the GMPEF Site

In 2025 and 2026, DOE issued four CX determinations under 10 CFR Part 1021 to authorize initial activities on the GMPEF Site (Leasing Parcel A). The *CX for the Lease of Real Property (Leasing Parcel A) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (CX-270990) evaluated the action of leasing approximately 100 acres of real property of the PGDP and found that it fell within an existing DOE CX for property transfers. The *CX for Site Characterization and Environmental Monitoring (Parcel A) at the Paducah Gaseous Diffusion Plant, Paducah* (CX-270817) determined that a two-phased Environmental Site Assessment (a records review and a non-intrusive onsite reconnaissance visit, followed, if needed, by site characterization and environmental monitoring activities, to include geotechnical soil borings and baseline sampling), fell within an existing DOE CX for site characterization and environmental modeling. Subsequently, CX for *Site Preparation Including Tree Clearing (Parcel A) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (CX-270853) evaluated early site preparation activities, specifically the clearing and grubbing of approximately 70 acres of vegetation, which was completed in February 2026, and determined that the activity fell within an existing U.S. Fish and Wildlife Service (USFWS) CX for harvest of live trees. The CX for *General Matter, Inc. Site Preparation (Parcel A) at the Paducah Gaseous Diffusion Plant, Kevil, McCracken, Kentucky* (CX-271063) evaluated the action of rough grading Parcel A Terrain after completing tree-clearing activities and determined that the activity fell under existing DOE CXs for routine maintenance, support buildings, and stormwater runoff control. These determinations established that the preliminary stages of the project do not individually or cumulatively have a significant effect on the human environment.

On August 18, 2026, DOE issued an Environmental Assessment (EA), the *Environmental Assessment for General Matter's Site Preparation and Licensing Activities in Parcel A of the Paducah Site in McCracken County, KY (DOE/EA-2327)*, to evaluate and complete certain site preparation activities and licensing, construction, operation, and eventual decommissioning of essential radiological and nonradiological auxiliary facilities in time to support the broader GMPEF project schedule. This EA analyzed the potential environmental consequences related to preliminary site preparation activities that are not included in NRC's 10 CFR 70.4 and 10 CFR 40.4 definitions of "construction." Additionally, it evaluated licensing through the Commonwealth of Kentucky to construct, operate, and eventually decommission a UF_6 storage pad, and to receive and store Depleted-up-to-Natural UF_6 at the GMPEF Site. The evaluation concluded that impacts across all resource areas—including air, geology and soils, visual, cultural and ecology—would be SMALL. DOE issued a Finding of No Significant Impact on August 18, 2026. With this EA and Finding of No Significant Impact, GeM aims to complete the following activities in alignment with the broader GMPEF project schedule:

- Site Clearing (complete in Parcel A)
- Rough Grading (complete in Parcel A)
- Soil Characterization, Treatment, Stabilization, and Improvements
- Installation of Underground Utilities
- Final Grading
- Construction of Administrative Buildings:
  - Administrative and Security Building
  - Warehouse Building
  - Central Utilities Building
  - Access Roads
  - Parking Lots

- Equipment Storage Pads
- Construct, operate, and eventually decommission a UF_6 storage pad, and to receive and store Depleted-up-to-Natural UF_6 at the GMPEF Site, licensed by the Commonwealth of Kentucky.

The site preparation and construction activities defined in the 2026 EA are expected to take less than a year.

A separate NEPA analysis will be completed for site preparation activities on Parcel C by the appropriate regulatory authority. This NEPA evaluation will analyze the potential environmental consequences of preliminary site preparation activities that are not included within NRC's definitions of "construction" under 10 CFR 70.4 and 10 CFR 40.4, as well as all other matters identified.

1.2 Purpose and Need for the Proposed Action

The purpose of the Proposed Action would be to allow GeM to construct and operate a facility to enrich uranium-235 (U-235) to up to 5 percent by weight (LEU) and up to 20 percent by weight (HALEU) using GeM's [redacted] (Trade Secret / Confidential Commercial Information) enrichment technology. The Proposed Action is intended to satisfy the need for additional reliable and economical domestic sources of enriched uranium supply. The GMPEF's design and efficiency will strengthen and diversify U.S.-based supply and support expected organic growth in the United States and in global nuclear power industries. By supplying enrichment services to commercial nuclear fuel fabrication plants, the GMPEF would support new and reliable capacity as the industry pivots away from Russian supply, while simultaneously reestablishing U.S. enrichment leadership.

The need for the Proposed Action manifests itself in two primary respects:

- The need for new and domestic enriched uranium to fulfill nuclear industry demands in a post-Russian supply era.
- The need for domestic uranium enrichment capacity for national energy security and non-proliferation objectives.

1.3 Market Analysis

Market Analysis for Enriched Uranium

The PLEF ER (GLE, 2025) contains recent information on enriched uranium market conditions. Therefore, the GMPEF market analysis heavily references the PLEF ER (GLE, 2025) supplemented by information from the National Enrichment Facility ER (LES, 2005) and other information.

Actual and projected increases in U.S. nuclear power generating capacity indicate an increasing national demand for uranium-enrichment services. Today, the U.S. has a significant domestic uranium enrichment capacity deficit compared to demand. This deficit was highlighted by the Russian invasion of Ukraine. Russia currently supplies approximately 20 percent of U.S. enrichment requirements. Congress passed into law a full ban of Russian imports beginning in 2028 (Prohibiting Russian Uranium Imports Act, Public Law No. 118-62). Existing U.S. enrichment capacity and those from Western allies are not able to provide a dependable and economic source of supply for the current operating fleet (GAO, 2026). With U.S. government targets to triple nuclear energy by 2050, the Nation requires new sources of enrichment services. Congress recognized the urgency of this issue by appropriating $2.7 billion in Fiscal Year 2024 to fund new enrichment capacity and DOE created a Low-Enriched Uranium Acquisition Program to deploy new domestic enrichment capacity (GLE, 2025).

The GMPEF would enrich Depleted-up-to-Natural UF_6, and natural UF_6 to LEU, and LEU to HALEU to satisfy the need for additional reliable and economical domestic sources of enriched uranium supply, particularly

as previously available Russian sources of enriched uranium will no longer be available and the Nation and our allies look to expand nuclear generation. Production at the GMPEF also reduces DOE's legacy environmental liability of depleted uranium tails by turning them into an asset supporting commercial nuclear fuel needs.

The following sections discuss requirements for enrichment services. Section 1.3.1, *Forecast of Installation Nuclear Power Generating Capacity*, presents a forecast of installed nuclear power generating capacity: Section 1.3.2, *Uranium Enrichment Requirements Forecast*, presents a forecast of uranium enrichment requirements; Section 1.3.3, *Current and Potential Future Sources of Uranium Enrichment Services*, discusses current and potential future sources of uranium enrichment services throughout the world; Section 1.3.4, *Market Analysis of Supply and Requirements*, discusses market supply and Section 1.3.5, *Commercial Considerations*, discusses various commercial considerations.

1.3.1 Forecast of Installation Nuclear Power Generating Capacity

The United States and the western world are facing an enrichment and conversion capacity deficit over the coming decade at a time when the need for carbon-free baseload electricity provided by nuclear power is surging. To meet domestic nuclear energy needs, multiple facilities have submitted nuclear power plant applications and multiple facilities have recently received licenses as shown in Table 1-1.

Table 1-1: Expected New U.S. Nuclear Power Plant Applications as of September 2026

Applicant	Project Name/Design	Application Type	Status	Date of Application
SMR Pre-Application Activities				
Westinghouse Electric Company	AP300	Pre-Application for a Design Certification	In progress	TBD
GE-Hitachi Nuclear Energy	BWRX-300	Pre-Application	In progress	TBD
Deployable Energy	Microreactor (HTGR)	Pre-Application	In progress	TBD
Energy Northwest New Nuclear	High-temperature gas-cooled reactor (HTGR)	Pre-Application	In progress	TBD
General Atomics	HTGR	Pre-Application	In progress	TBD
General Atomics Electromagnetic Systems	HTGR	Pre-Application	In progress	TBD
Advance Energy Bridge (AEB)	HTGR	Pre-Application	In progress	TBD
Radiant Industries, Inc.	Microreactor (HTGR)	Pre-Application	In progress	TBD
Terra Innovatum	SOLO (Microreactor, HTGR)	Pre-Application	In progress	TBD
University of Illinois Urbana-Champaign/NANO Nuclear Energy Inc.	Microreactor (HTGR)	Pre-Application	In progress	TBD
X-Energy, LLC	Xe-100 (HTGR)	Pre-Application	In progress	TBD
X-Energy, LLC	Xenith (Microreactor, HTGR)	Pre-Application	In progress	TBD
Deep Fission	LWR	Pre-Application	In progress	TBD
Hadron Energy, Inc.	LWR	Pre-Application	In progress	TBD
Last Energy	Microreactor	Pre-Application	In progress	TBD
REPLOY Power, Inc.	LWR	Pre-Application	In progress	TBD
Rolls-Royce SMR Limited	LWR/SMR	Pre-Application	In progress	TBD
Abilene Christian University	MSR	Pre-Application	In progress	TBD
Kairos Power, LLC	MSR	Pre-Application	In progress	TBD
Natura Resources	MSR	Pre-Application	In progress	TBD
TerraPower, LLC	MCFR	Pre-Application	In progress	TBD

Table 1-1: Expected New U.S. Nuclear Power Plant Applications as of September 2026

Applicant	Project Name/Design	Application Type	Status	Date of Application
Terrestrial Energy USA, Inc.	MSR	Pre-Application	In progress	TBD
Aalo Atomics	Microreactor (Liquid Metal)	Pre-Application	In progress	TBD
ARC Clean Technology	Microreactor (Liquid Metal)	Pre-Application	In progress	TBD
First American Nuclear Co.	Liquid Metal	Pre-Application	In progress	TBD
Newcleo Americas	Liquid Metal	Pre-Application	In progress	TBD
Oklo Inc.	Aurora (Liquid Metal)	Pre-Application	In progress	TBD
TerraPower, LLC&GE-Hitachi Nuclear Energy	Natrium (Sodium-Cooled Fast Reactor)	Pre-Application	In progress	TBD
Antares Nuclear, Inc.	Mark-0 (Microreactor)	Pre-Application	In progress	TBD
Appalachian Power Company	Not specified	Pre-Application	In progress	TBD
Apollo Atomics	Not specified	Pre-Application	In progress	TBD
AtkinsRéalis	Enhanced CANDU 6	Pre-Application	In progress	TBD
Blue Energy, Inc.	Not specified	Pre-Application	In progress	TBD
ELYON-5	Not specified	Pre-Application	In progress	TBD
Japan Atomic Energy Agency	Not specified (international cooperation)	Pre-Application	In progress	TBD
Texas A&M University – RELLIS Campus	Not specified	Pre-Application	In progress	TBD
Westinghouse Electric Company	eVinci (microreactor)	Pre-Application	In progress	TBD
Current Licensing Reviews of New Reactors				
NuScale Power, LLC	US460 (SMR)	Standard Design Approval for a small modular reactor (US460)	Issued	1/1/2023
Long Mott Energy, LLC (subsidiary of Dow)	Long Mott Generating Station, Xe-100 (4 units) (CP)	Construction Permit Application	Under Review	3/31/2025
Tennessee Valley Authority	Clinch River Nuclear Site	Construction Permit Application (10 CFR Part 50)	Under Review	Revised application submitted 4/29/2026
Fermi America LLC	Project Matador Nuclear (PMG)	Combined License Application	Under Review	6/17/2025
Entergy Operations, Inc. / System Energy Resources	Grand Gulf ESP Site, MS	Early Site Permit Renewal Application	Under Review	9/24/2025
SMR, LLC, a subsidiary of Holtec International	SMR-300	Phased Construction Permit Application	Under Review	12/30/2025
Duke Energy	Duke Energy Belews Creek	Early Site Permit Application	Under Review	12/30/2025
Combined Licenses Issued - LWR				
Florida Power & Light Company	Turkey Point, Units 6 and 7/AP1000	Combined License Applications for New Reactors	Issued	6/30/2009
Detroit Edison Company	Fermi, Unit 3/ESBWR	Combined License Applications for New Reactors	Issued	9/18/2008

Table 1-1: Expected New U.S. Nuclear Power Plant Applications as of September 2026

Applicant	Project Name/Design	Application Type	Status	Date of Application
Duke Energy Florida, LLC	Levy Nuclear Plant, Units 1 and 2/AP1000	Combined License Applications for New Reactors	Terminated 4/26/2018 (withdrawn at licensee's request)	7/30/2008
Southern Nuclear Operating Company	Vogtle, Units 3 and 4/ AP1000	Combined License Applications for New Reactors	Issued – Units 3 & 4 are now in commercial operation	3/28/2008
South Carolina Electric & Gas	Virgil C. Summer, Units 2 and 3/AP1000	Combined License Applications for New Reactors	Terminated 3/6/2019	3/27/2008
Duke Energy	William States Lee III, Units 1 and 2/AP1000	Combined License Applications for New Reactors	Issued	12/13/2007
Dominion Virginia Power	North Anna, Unit 3/ ESBWR	Combined License Applications for New Reactors	Issued	11/27/2007
Nuclear Innovation North America, LLC	South Texas Project, Units 3 and 4/ABWR	Combined License Applications for New Reactors	Issued	9/20/2007

Source: (GLE, 2025)
Key: CFR = Code of Federal Regulations; LLC = Limited Liability Company; LWR = light water reactor; SMR = small modular reactor; TBD = to be determined; U.S. = United States
Note:
Shepherd Power, LLC is excluded from the above table based on inactivity. Inactivity is defined by NRC as having no project activity (e.g., interactions with the NRC, updates to Regulatory Engagement Plans, etc.) for at least 1 year.

1.3.2 Uranium Enrichment Requirements Forecast

The global market for uranium enrichment services, measured in Separative Work Units (SWUs), is a crucial component of the nuclear fuel cycle. Several major players dominate the market, each with substantial enrichment capacity. For example, Russia (Rosatom/Tenex) holds a significant portion of the global enrichment market, with a capacity exceeding 27 million SWUs per year (WNA, 2025a). Russia's enrichment services meet roughly 40 percent of the worldwide demand (DOE, 2025b).

According to the World Nuclear Association's (WNA) 2025 report (WNA, 2025a), world reactor requirements for uranium in 2025 are estimated at about 68,920 metric tons of uranium, or tonnes uranium. The requirement is expected to rise to almost 150,000 tonnes uranium in 2040 (WNA, 2025a). This increased demand is likely to put pressure on enrichment services and demonstrates the need for the GMPEF uranium enrichment capability.

1.3.3 Current and Potential Future Sources of Uranium Enrichment Services

1.3.3.1 *Low-Enriched Uranium*

Currently there are three major producers of enriched uranium. Orano, Rosatom, and Urenco USA operate large commercial enrichment plants in France, Germany, Netherlands, United Kingdom, United States, and Russia. In China, the China National Nuclear Corporation is a major domestic supplier and is pursuing export sales. In Japan and Brazil, domestic fuel cycle companies manage modest supply capability (WNA, 2025a).

DOE is working to expand its domestic commercial LEU enrichment capabilities to support the fuel supply for our Nation's fleet of nuclear reactors (DOE, 2025b). This expansion will promote diversity in the LEU market and provide a reliable supply of commercial nuclear fuel critical to U.S. clean energy and energy security goals. DOE selected six companies that will compete for future work to supply LEU, fostering strong commercial sector investment. The companies include:

- American Centrifuge Operating, LLC
- GeM
- GLE
- LES
- Laser Isotope Separation Technologies Inc.
- Orano Federal Services, LLC

Developing domestic capacity for LEU ensures an adequate fuel supply is available from trusted sources to maintain the current fleet of U.S. reactors and builds a strong base to supply future deployments of advanced nuclear reactors both at home and abroad.

Through these contracts, DOE will acquire LEU generated by new domestic sources—either at entirely new enrichment facilities or from projects that expand their existing capacity. All contracts will last for up to 10 years.

1.3.3.2 *High-Assay, Low-Enriched Uranium*

Unlike conventional LEU, commercial-scale HALEU faces production limitations worldwide. Historically, only Russia (Rosatom/TENEX) and China possessed the infrastructure to produce HALEU at scale; however, the U.S. ban on Russian uranium imports, enacted in 2024 and extending through 2040, has eliminated Russia as a viable HALEU supplier to the United States (WNA, 2025a). In the United States, Centrus Energy's subsidiary, American Centrifuge Operating, LLC, currently operates the Nation's only demonstration-scale HALEU production capability, at its facility in Piketon, Ohio, having delivered approximately 900 kilograms of HALEU to DOE by mid-2025.

DOE is currently working to expand domestic commercial HALEU enrichment capabilities to support the fuel supply for the Nation's next generation of advanced nuclear reactors (DOE, 2025c). The following companies were awarded task orders to provide enrichment services for HALEU:

- American Centrifuge Operating, LLC
- General Matter, Inc.

DOE's investments into the HALEU markets reflect the Nation's accelerating demand to develop advanced reactors. Many advanced reactor designs require HALEU, and the lack of such a source would impede both the demonstration of these technologies and the development of future advanced reactor technologies (DOE, 2024a).

On June 4, 2026, Antares Nuclear's Mark-0 microreactor achieved zero-power criticality at DOE's Idaho National Laboratory — the first privately developed non-light-water reactor to reach criticality in the United States in more than four decades, and the first reactor under DOE's Reactor Pilot Program to do so, fulfilling a target set by Executive Order 14301 (DOE, 2026a). Antares is one of several companies participating in the Reactor Pilot Program, alongside DOE's Advanced Reactor Demonstration Program flagship projects, TerraPower's Natrium reactor, and X-energy's Xe-100 reactor. Nearly all of these designs require HALEU, yet domestic commercial HALEU production remains limited to demonstration-scale quantities, measured in hundreds of kilograms rather than the thousands of metric tons that will ultimately be required. Even DOE's most mature advanced reactor program has reportedly explored

foreign HALEU sourcing due to this domestic supply gap, underscoring the urgency of expanding the Nation's enrichment infrastructure, including HALEU-capable capacity such as that proposed for the GMPEF, to support the advanced reactor fleet now moving from demonstration toward commercial deployment.

1.3.4 Market Analysis of Supply and Requirements

Currently, some of the demand for enriched uranium in the United States is supplied by foreign sources. Increased domestic production of enriched uranium reduces the possibility that the uranium supply could be vulnerable to international political pressure. In addition, over the next several decades, demand for enriched uranium is projected to grow. Table 1-2 shows that the maximum anticipated market requirements could result in unfulfilled market requirements. Thus, GeM's projected production of several million SWUs at the GMPEF has the potential to be critical in meeting the nuclear power industry's needs and increasing the Nation's energy security.

Table 1-2: U.S. Civilian Nuclear Power Reactor Uranium Market Requirements (in thousand pounds U_3O_8 equivalent)

Year	Maximum Under Purchase Contracts	Unfilled Market Requirements	Maximum Anticipated Market Requirements	Enrichment Feed Deliveries
2023	42,793	2,100	44,893	43,507
2024	42,859	4,875	47,735	45,823
2025	36,878	5,276	42,154	44,166
2026	25,919	8,689	34,608	42,489
2027	23,598	10,356	33,955	38,976
2028	17,818	21,621	39,440	39,116
2029	4,544	24,979	39,523	36,380
2030	W	W	39,236	37,919
2031	W	W	40,587	35,501
2032	W	W	40,405	37,821
Total	223,381	179,155	402,536	401,696

Source: (GLE, 2025)
Key: U_3O_8 = triuranium octoxide; U.S. = United States; W = withheld
Note: Maximum anticipated uranium market requirements of owners and operators of U.S. civilian nuclear power reactors, 2023–2032, at the end of 2022 (thousand pounds U_3O_8 equivalent).

1.3.5 Commercial Considerations

Commercial nuclear power plants are a significant component of the U.S. electric power supply system, providing 18.2 percent of the electricity that was consumed in the United States in 2024 (see Table 1-3). The owners and operators of nuclear power plants have two primary objectives in purchasing nuclear reactor fuel. The first objective is security of supply, which is the ability of the purchaser to rely on their suppliers to deliver nuclear reactor fuel materials and services on schedule and within technical specifications, according to the terms of the contract, for the contract's entire term. The second objective is to ensure a competitive procurement process, which is the ability of the purchaser to select from among multiple suppliers through a process that is conducive to fostering reasonable prices for the nuclear reactor fuel materials and services that are purchased (LES, 2005). Nuclear reactor fuel fabricators likewise have similar objectives and concerns in purchasing enriched uranium. Production by the GMPEF enhances the ability of the owners and operators of commercial nuclear power plants and fuel fabricators to achieve their objectives.

Table 1-3: World Nuclear Power Reactors and Uranium Required

Country	Nuclear Electricity Generation 2024		Reactors Operable		Reactors Under Construction		Reactors Planned		Reactors Proposed		Uranium Required 2024
	TWh	%e	No.	MWe Net	No.	MWe Gross	No.	MWe Gross	No.	MWe Gross	Tonnes U
Argentina	10.4	7.4	3	1,641	1	29	0	0	4	1,200	219
Armenia	2.6	31	1	416	0	0	0	0	1	1,060	55
Bangladesh	0	0	0	0	2	2,400	0	0	2	2,400	371
Belarus	14.7	36.3	2	2,220	0	0	0	0	0	0	357
Belgium	29.7	41.5	4	3,463	0	0	0	0	0	0	516
Brazil	14.9	2.3	2	1,884	1	1,405	0	0	8	8,000	339
Bulgaria	15.1	41.6	2	2,006	0	0	2	2,500	0	0	334
Canada	81.2	13.4	17	12,669	0	0	2	400	12	6,400	1,455
China	417.5	4.7	58	56,888	32	36,790	44	49,406	147	174,850	13,132
Czech Republic	28	40.2	6	4,212	0	0	5	5,270	0	0	715
Egypt	0	0	0	0	4	4,800	0	0	0	0	0
Estonia	0	0	0	0	0	0	0	0	2	600	0
Finland	31.1	39.1	5	4,369	0	0	0	0	0	0	616
France	364.4	67.3	57	63,000	1	1,650	0	0	6	9,900	8,232
Hungary	15.2	47.1	4	1,916	0	0	2	2,400	0	0	320
India	49.9	3.3	24	8,055	6	5,200	14	9,400	26	30,800	1,725
Indonesia	0	0	0	0	0	0	0	0	0	2	500
Iran	6.4	1.7	1	915	1	1,057	2	1,417	4	5,000	153
Japan [a]	84.9	8	33	31,679	2	2,756	0	0	1	1,385	2,180
Kazakhstan	0	0	0	0	0	0	2	2,400	0	0	0
Korea RO (South)	179.4	31.7	26	25,825	3	4,200	1	1,400	0	0	4,309
Mexico	12	4.8	2	1,552	0	0	0	0	0	0	237
Netherlands	3.4	2.8	1	482	0	0	0	0	2	2,650	69
Pakistan	22.8	16.7	6	3,262	1	1,100	0	0	0	0	555
Poland	0	0	0	0	0	0	3	3,750	26	10,000	0
Romania	10.0	19.8	2	1,300	0	0	2	1,440	6	462	185
Russia	202.1	17.8	36	26,802	7	5,290	23	21,655	9	754	5,436
Saudi Arabia	0	0	0	0	0	0	0	0	2	2,800	0
Slovakia	17	60.6	5	2,308	1	471	0	0	1	1,200	527
Slovenia	5.6	35	1	688	0	0	0	0	1	1,200	127
South Africa	7.8	3.9	2	1,854	0	0	0	0	2	2,500	277

Table 1-3: World Nuclear Power Reactors and Uranium Required

Country	Nuclear Electricity Generation 2024		Reactors Operable		Reactors Under Construction		Reactors Planned		Reactors Proposed		Uranium Required 2024
	TWh	%e	No.	MWe Net	No.	MWe Gross	No.	MWe Gross	No.	MWe Gross	Tonnes U
Spain	52.1	19.9	7	7,123	0	0	0	0	0	0	1,218
Sweden	48.7	29.1	6	7,008	0	0	2	2,500	0	0	932
Switzerland	23.0	28.6	4	2,973	0	0	0	0	0	0	412
Turkey	0	0	0	0	4	4,800	0	0	8	9,600	882
Ukraine [a, b]	49.9	52	15	13,107	2	1,900	2	2,500	7	8,750	1,673
United Arab Emirates	36.5	21.8	4	5,348	0	0	0	0	0	0	853
United Kingdom	37.3	12.3	9	5,883	2	3,440	2	3,340	0	0	817
United States of America	781.9	18.2	94	96,952	0	0	0	0	21	4,680	18,137
Uzbekistan	0	0	0	0	0	0	6	330	2	2,400	0
Vietnam	0	0	0	0	0	0	0	0	4	1,000	0
World [c]	2,667	9%	439	397,800	69	75,638	114	110,108	298	282,091	67,517

Sources: (GLE, 2025; WNA, 2025b)
Key: % = percent; %e = percentage of electricity; MWe = Megawatt (electrical as distinct from thermal); No. = Number; TWh = terawatt hour (billion kilowatt hours); U = uranium
Notes:
[a] Under Construction figures include a number of units where construction is currently suspended: Angra 3 (Brazil); Ohma 1 and Shimane 3 (Japan); Khmelnitski 3 & 4 (Ukraine).
[b] Ukraine 2024 electricity generation estimated.
[c] World figures include Taiwan, which generated a total of 17.2 TWh from nuclear in 2023 (accounting for 6.9% of Taiwan's total electricity generation). The island's last reactor was shut down in May 2025.

1.4 Proposed Action

The Proposed Action is for GeM to construct and operate a uranium enrichment facility at the GMPEF Site in accordance with the Atomic Energy Act of 1954, as amended; 10 CFR Part 70; and other applicable laws and regulations. The GMPEF footprint (Figure 1-3 and Figure 1-4) comprises most of the approximately 107-acre GMPEF Site. Within the Conceptual Site Plan footprint, there would be uranium enrichment buildings; several administrative and other support buildings; a parking lot; cylinder storage pads containing natural UF_6, DUF_6, LEU, and HALEU[3]; and maintained landscaped areas. Additional Proposed Action details are provided in Section 2.1.2, *Proposed Action*.

[redacted] (Trade Secret / Confidential Commercial Information)

For the purpose of evaluating potential environmental impacts that would result from implementation of the Proposed Action (as presented in Chapter 4.0, *Environmental Impacts*), impacts are presented for three distinct project phases. The first phase is construction phase, which is expected to take 2 years of construction-related activities as defined by NRC's 10 CFR 70.4 definitions of "construction." This phase would include construction of the uranium enrichment buildings and support facilities. The second phase is the operation phase, which would consist of the 40-year initial license term of operation of the GMPEF, and two potential 20-year license renewal periods. Some additional construction activities are expected to continue during operations, primarily inside the buildings. Any impacts associated with these construction activities are addressed as part of the operation phase. The third phase is the decommissioning phase, which would consist of the scheduled 5-year period of decontamination and decommissioning (D&D) of the GMPEF.

1.5 Applicable Regulatory Requirements, Permits, and Required Consultations

This section describes the pertinent regulatory framework as it applies to the GMPEF. The status of regulatory agency authorizations and consultations is summarized in Table 1-4.

NRC published a Draft EIS for the PLEF in March 2026 (NRC, 2026). The Draft PLEF EIS analyzes the construction, operation, and decommissioning of a facility similar to the GMPEF at an adjacent location. Therefore, much of the discussion of applicable regulatory requirements, permits, and required consultations from the PLEF EIS is incorporated by reference and reproduced here.

Table 1-4: Status of Regulatory Agency Authorizations and Consultations

Agency	Authority	Activity	Status
Federal Agencies			
NRC	Atomic Energy Act of 1954, as amended	GMPEF License	License application (including this ER) submitted in 2026.
USACE	CWA	Jurisdictional Determination of WOTUS	Regulatory guidance NPR letter and AJD received from

[3] The licensing of Depleted-up-to-Natural UF_6 cylinder storage pads through the Commonwealth of Kentucky, to include the construction, operation, and eventual decommissioning has been evaluated in the *Environmental Assessment (EA) for General Matter's Site Preparation and Licensing Activities in Parcel A of the Paducah Site in McCracken County, KY* (DOE/EA-2327).

Table 1-4: Status of Regulatory Agency Authorizations and Consultations

Agency	Authority	Activity	Status
			USACE on December 19, 2025,for Parcel A (100 acres of the Project Area). For impacts to jurisdictional waters within Parcel C (the proposed 6.8-acre switchyard area), GeM will consult with the USACE Louisville District office and obtain a Section 404 Nationwide Permit or an Individual Permit (for significant impacts).
		Section 404 Permit	Not applicable.
USFWS	ESA, Section 7, Bald and Golden Eagle Protection Act, Migratory Bird Treaty Act	Threatened & Endangered Species Consultation Concurrence on impact assessment	Section 7 Effects Determination concurrence letter received on October 28, 2025, from the USFWS.
State Agencies			
KDAQ	CAA	Operating Permits, such as Title V or State Origin Permit	To be obtained.
KDOW	CWA	Section 401 Water Quality Certification affirms that the discharge will not violate Kentucky water quality standards.	Concurrence obtained from the KEEC for Parcel A (100 acres of the Project Area, where project does not require a 401 Water Quality Certification due to the lack of jurisdictional impacts). Certification will be obtained for impacts to wetland features within Parcel C (the proposed 6.8-acre switchyard area).
		KPDES General Permit for Construction Stormwater Management and SWPPP	Obtained.
		Groundwater Protection Plan	To be developed.
KDWM	RCRA	Hazardous Waste Generator Identification Number	To be obtained.
Kentucky Radioactive Materials Program	902 KAR 100:015	Radioactive Materials License	To be obtained.
KHC	Section 106 of the NHPA	Consultation on presence and significance of archeological sites.	On April 22, 2025, KHC provided recommendations of no archaeological historic properties in Physical Area of Potential Effect and no

Table 1-4: Status of Regulatory Agency Authorizations and Consultations

Agency	Authority	Activity	Status
			adverse effect to historic-age architectural historic properties within the Non-Physical Area of Potential Effect.
Kentucky Office of State Archaeology	KRS 164.705 through 164.735	Obtained data of previously recorded archaeological sites and surveys; issues Kentucky Antiquity Act Permits.	Data obtained May 20, 2024. Project registered as FY24-12826 and by CRA as FY25-12962; Kentucky Antiquity Act Permit 2024–56 obtained by CRA on September 30, 2024.
Kentucky Transportation Cabinet		Encroachment Permits and Traffic Impact Study	To be obtained.

Key: AJD = Approved Jurisdictional Determination; CAA = Clean Air Act; CFR = Code of Federal Regulations; CRA = Cultural Resource Analysts, Inc; CWA = Clean Water Act; EPA = Environmental Protection Agency; ESA = Endangered Species Act; FY = Fiscal Year; GeM = General Matter, Inc.; GMPEF = General Matter Paducah Enrichment Facility; KAR = Kentucky Administrative Regulation; KDAQ = Kentucky Division for Air Quality; KDOW = Kentucky Division of Water; KDWM = Kentucky Division of Waste Management; KEEC = Kentucky Energy and Environment Cabinet; KHC = Kentucky Heritage Council; KPDES = Kentucky Pollutant Discharge Elimination System; KRS = Kentucky Revised Statutes; NHPA = National Historic Preservation Act; NPR = No Permit Required; NRC = United States Nuclear Regulatory Commission; RCRA = Resource Conservation and Recovery Act; SWPPP = Storm Water Pollution Prevention Plan; USACE = U.S. Army Corps of Engineers; USFWS = United States Fish and Wildlife Service; WOTUS = Waters of the United States

1.5.1 Federal Agencies

1.5.1.1 *U.S. Nuclear Regulatory Commission*

The NRC establishes standards for protection against radiation hazards from licensed activities.

NRC licenses are issued pursuant to the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974. The GMPEF would likely obtain a license under 10 CFR Part 70, *Domestic Licensing of Special Nuclear Material*. This is the main NRC regulation for GeM licensed activity. Other applicable NRC regulations are described below:

- **10 CFR Part 2, *Agency Rules of Practice and Procedure*.** This regulation establishes the procedures for NRC hearings, rulemaking proceedings, adjudications, and requests for hearing on licensing actions, including the procedures applicable to public participation.
- **10 CFR Part 19, Notices, *Instructions and Reports to Workers: Inspection and Investigations*.** This regulation requires licensees to post notices and provide instructions to workers regarding applicable radiation protection standards, and to inform workers of their rights, including the right to request an NRC inspection.
- **10 CFR Part 20**, ***Standards for Protection Against Radiation***. These standards relate to radiation dose limits to individual workers and members of the public.
- **10 CFR Part 21, *Reporting of Defects and Noncompliance*.** This regulation establishes requirements for licensees to identify and report defects and noncompliance with NRC requirements that could create a substantial safety hazard.

- **10 CFR Part 40, *Domestic Licensing of Source Material.*** This regulation establishes procedures and criteria for the issuance of licenses to receive, own, possess, use, and transfer source material.
- **10 CFR Part 51, *Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions***. These regulations relate to the agency's discharge of its obligations under NEPA. Part 51 requires submission of the ER in conjunction with the license application for a uranium enrichment facility.
- **10 CFR Part 61, *Licensing Requirements for Land Disposal of Radioactive Waste*.** This regulation establishes procedures and criteria for the licensing of land disposal of radioactive waste, relevant to the disposition of low-level radioactive waste (LLRW) generated during enrichment operations.
- **10 CFR Part 70, *Domestic Licensing of Special Nuclear Material*.** This regulation establishes procedures and criteria for the issuance of licenses to receive title to own, acquire, deliver, receive, possess, use, and transfer special nuclear material.
- **10 CFR Part 71, *Packaging and Transportation of Radioactive Material***. This regulation specifies shipping containers and the safe packaging and transportation of radioactive materials under authority of the NRC and the U.S. Department of Transportation (DOT) (see also Section 1.5.1.3, *U.S. Department of Transportation*, regarding DOT regulation of radioactive material transport).
- **10 CFR Part 73, *Physical Protection of Plants and Materials***. This regulation establishes requirements for physical protection systems for the protection of special nuclear material at fixed sites and in transit and of plants in which special nuclear material is used.
- **10 CFR Part 74, *Material Control and Accounting of Special Nuclear Material*.** This regulation establishes requirements for control and accounting of special nuclear material, including documentation of transfer of material.
- **10 CFR Part 95**, ***Facility Security Clearance and Safeguarding of National Security Information and Restricted Data*.** This regulation establishes procedures for obtaining facility security clearance and for safeguarding Secret and Confidential National Security Information and Restricted Data received or developed in conjunction with activities licensed, certified, or regulated by the NRC.
- **10 CFR Part 110, *Export and Import of Nuclear Equipment and Material.*** This regulation establishes NRC licensing requirements governing the export and import of nuclear equipment, material, and technology, relevant to GeM's stated interest in export-oriented enrichment services.
- **10 CFR Part 140, *Financial Protection Requirements and Indemnity Agreements*.** This regulation establishes requirements for financial protection (insurance) and indemnity agreements that certain NRC licensees must maintain to cover liability for radiological incidents.

1.5.1.2 *U.S. Environmental Protection Agency*

The EPA has primary authority relating to compliance with several statutes and regulations outlined in this section and it has delegated regulatory jurisdiction to the Kentucky Energy and Environment Cabinet (KEEC), Department of Environmental Protection (KDEP) (see Section 1.5.2, *State Agencies*) for permitting, monitoring, and reporting activities relating to these statutes, regulations, and associated programs.

- **40 CFR Part 190, *Subpart B, Environmental Standards for the Uranium Fuel Cycle*.** These standards establish the maximum doses to the body organs resulting from operational, normal releases and received by members of the public.
- **Clean Water Act**. The Clean Water Act (CWA) establishes the basic structure for regulating the discharge of pollutants into the "Waters of the United States" (WOTUS). The EPA is the principal administrative agency of the CWA; however, responsibilities have been delegated to other Federal

and State agencies. The CWA establishes water quality standards for contaminants in surface waters, makes it unlawful to discharge pollutants from a point source into navigable waters (unless a permit is obtained), and addresses problems posed by nonpoint-source pollution. Section 404 of the CWA authorizes the U.S. Army Corps of Engineers (USACE) to issue permits for the discharge of dredged or fill material into WOTUS (see Section 1.5.1.6, *U.S. Army Corps of Engineers*). In Kentucky, implementation and enforcement of Sections 401 and 402 of the CWA (Water Quality Certification [WQC] and National Pollutant Discharge Elimination System, respectively) have been delegated to the Kentucky Division of Water (KDOW) (see Section 1.5.2.1.2, *Kentucky Division of Water*). It is anticipated that KDOW will issue the Kentucky Pollutant Discharge Elimination System (KPDES) permit for the GMPEF.

- **Clean Air Act**. As amended in 1970, the Clean Air Act (CAA) launched an ambitious national campaign to maintain healthy air quality by controlling air pollution. The 1990 amendments to the CAA renewed and intensified national efforts to reduce air pollution in the United States. In Kentucky, the CAA is implemented by the KDEP Division for Air Quality (KDAQ) (see Section 1.5.2.1.1, *Kentucky Division for Air Quality*).
- **Safe Drinking Water Act**. The Safe Drinking Water Act provides for protection of public water supply systems and underground sources of drinking water and 40 CFR 141.2 (*Definitions – Code of Federal Regulations*) defines public water supply systems as those that provide water for human consumption to at least 25 people or at least 15 connections. Underground sources of drinking water are also protected from contaminated releases and spills by this act. In Kentucky, the KDOW is responsible for regulating public water systems to ensure public health protection (see Section 1.5.2.1.2**,** *Kentucky Division of Water*).
- Resource Conservation and Recovery Act
  - **Notification of Regulated Waste Activity**. Section 3010 of Subtitle C of the Resource Conservation and Recovery Act (RCRA) requires any person who generates, transports, or recycles regulated wastes or who owns or operates a facility for the treatment, storage, or disposal of regulated wastes to notify EPA of their activities, including the location and general description of the activities and the regulated wastes handled. This pertains to nonhazardous solid waste and hazardous wastes. RCRA is enforced by the KDEP Division of Waste Management (KDWM) (see Section 1.5.2.1.3 Kentucky Division of Waste Management).
  - **Hazardous Waste Generators ID**. Subtitle C of the RCRA regulates hazardous waste generators. A generator is any person or site whose processes and actions create hazardous waste (see 40 CFR 260.10, *Hazardous Waste Management System – General*). Generators are divided into three categories (i.e., large, small, and conditionally exempt), based on the quantity of waste they produce per month. Per 40 CFR Part 262 (*Standards Applicable to Generators of Hazardous Waste*), all large- and small-quantity generators are required to obtain an EPA identification number; this pertains to nonhazardous solid waste and hazardous wastes. RCRA is enforced by the KDWM (see Section 1.5.2.1.3 Kentucky Division of Waste Management).
- **Emergency Planning and Community Right-to-Know Act of 1986 (40 CFR 350 to 372)**. The Superfund Amendments and Reauthorization Act of 1986 created the Emergency Planning and Community Right-to-Know Act—also known as Title III—a statute designed to improve community access to information about chemical hazards and to facilitate the development of chemical emergency response plans by State/Tribe and local governments. Emergency Planning and Community Right-to-Know Act provisions help increase the public's knowledge and access to information on chemicals at individual facilities, the uses of these chemicals, and their release into

the environment. Working with the facilities, states and communities can use the information to improve chemical safety and protect public health and the environment.

- **Noise Control Act of 1972**. The Noise Control Act (42 U.S.C. § 4901 et seq.) transfers the responsibility of noise control to State and local governments. Commercial facilities are required to comply with Federal, State, interstate, and local requirements regarding noise control. In Kentucky, noise control falls under Subchapter 30 of the Kentucky Revised Statutes.

1.5.1.3 *U.S. Department of Transportation*

DOT requires compliance with the following regulations regarding transport of hazardous materials, including radioactive materials:

- 49 CFR Part 107, *Subpart G, Hazardous Materials Program Procedures, Registration and Fee to DOT as a Person Who Offers or Transports Hazardous Materials*
- 49 CFR Part 171, *General Information, Regulations, and Definitions*
- 49 CFR Parts 171-179, *Pipeline and Hazardous Materials Safety Administration*
- 49 CFR Part 173, *Shippers — General Requirements for Shipments and Packages, Subpart I: Class 7 (Radioactive) Materials*
- 49 CFR Part 177, *Carriage by Public Highway*
- 49 CFR Part 178, *Specification for Packagings* (see also Section 1.5.1.1, *U.S. Nuclear Regulatory Commission*, regarding NRC regulation of radioactive material packaging)

1.5.1.4 *U.S. Department of Agriculture*

This section describes the Farmland Protection Policy Act, which is administered by the U.S. Department of Agriculture's Natural Resources Conservation Service described below.

- **Farmland Protection Policy Act of 1981 (Public Law 97-98, 7 U.S.C. 4201).** The act is intended to minimize the impact that Federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. Federal programs are administered to be compatible with State, local units of government, and private programs and policies to protect farmland. For the purpose of this act, farmland includes prime farmland, unique farmland, and land of statewide or local importance.

1.5.1.5 *Advisory Council on Historic Preservation*

This section describes the National Historic Preservation Act (NHPA), which is administered by the Advisory Council on Historic Preservation. The Kentucky Heritage Council administers the national historic preservation program at the State level.

- **National Historic Preservation Act.** As amended (16 U.S.C. § 470 et seq.), the NHPA was enacted to protect the Nation's cultural resources. Section 106 and its implementing regulations in 36 CFR Part 800 require Federal agencies to take into account the effects of their undertakings on historic properties. The regulations call for public involvement in the Section 106 consultation process, as well as consultation with American Indian Tribes and State Historic Preservation Officers. This act is supplemented by the Archaeological and Historic Preservation Act and directs Federal agencies in recovering and preserving historic and archaeological data that would be lost as the result of construction activities.

1.5.1.6 *U.S. Army Corps of Engineers*

As stated in Section 1.5.1.2, *U.S. Environmental Protection Agency*, USACE has the responsibility for implementing, permitting, and enforcing provisions of the CWA. Section 404 of the CWA authorizes USACE to issue permits for the discharge of dredged or fill material into WOTUS. The USACE regulatory program is defined in 33 CFR Parts 320–330 *General Regulatory Policies*. Before an activity occurs, applicable permits must be obtained, and any compensatory mitigation must be determined. If USACE determines that a 404 permit is required because a proposed project involves impacts to wetlands or jurisdictional waters, then a 401 WQC is also required. The CWA delegates authority for the issuance of 401 WQCs for projects that require Federal permits to the States (see Section 1.5.2.1.2, *Kentucky Division of Water*).

1.5.1.7 *U.S. Department of Labor*

The U.S. Department of Labor's Occupational Safety & Health Administration regulates mitigation requirements and mandates proper training and equipment for workers. It also administers the Occupational Safety and Health Act of 1970, described below.

- **Occupational Safety and Health Act**. The act is designed to assure the safety of workers in the workplace; provide training, outreach, and education; establish partnerships; and encourage continual improvement in workplace safety and health. The Occupational Safety & Health Administration General Industry Regulations are described in 29 CFR Part 1910 (*Occupational Safety and Health Standards*).

1.5.1.8 *U.S. Department of the Interior*

The U.S Department of the Interior is responsible for managing and conserving most of the Nation's federally owned lands.

- **Endangered Species Act**. Section 7 of the Endangered Species Act (ESA) (16 U.S.C. § 1536) requires that any action likely to adversely affect a species classified as federally protected be subject to review by the Department of the Interior's USFWS). The purpose of the ESA of 1973, as amended, is to help preserve the Nation's valuable plant and wildlife resources that are imperiled. The ESA provides a means to help preserve these species and their habitats for future generations. Other species may receive additional protection under separate laws. Section 7 of the Act requires the NRC to consult with the USFWS or the National Marine Fisheries Service of the U.S. Department of Commerce to determine whether endangered and threatened species or their critical habitats are known to be in the vicinity of the proposed action. The USFWS works in coordination with the Kentucky Fish and Wildlife Commission to implement the ESA (see Section 1.5.2.1.5, *Kentucky Fish and Wildlife Commission*).
- **Federal Land Policy and Management Act of 1976**. As amended (43 U.S.C. 1701 et seq.), the Federal Land Policy and Management Act outlines functions of the Bureau of Land Management. Its mission is to sustain the health, diversity, and productivity of public lands.
- **The Bureau of Indian Affairs**. The Bureau of Indian Affairs is responsible for administrating and managing 55.7 million acres of land held in trust by the United States for American Indians, Indian Tribes, and Alaska Natives. There are 561 federally recognized Tribal governments in the United States (see Section 3.1.3, *Special Land Use Classifications*).

1.5.2 State Agencies

1.5.2.1 *Kentucky Department of Environmental Protection*

The KEEC is a State agency responsible for safeguarding and enhancing Kentucky's environment. Its mission includes enforcing laws related to natural resources, promoting environmental protection, and

ensuring the well-being of citizens. The KEEC comprises four main departments: (1) the Department for Environmental Protection, which is responsible for preserving and enhancing Kentucky's environment through divisions such as Air Quality, Waste Management, Water, and Enforcement and Compliance Assistance; (2) the Department for Natural Resources, which provides technical support, education, and funding to sustain the State's natural resources; (3) the Office of Energy Policy, which is responsible for improving the quality and security of life for Kentuckians by developing efficient, sustainable energy solutions and strategies for the Commonwealth; and (4) the Office of Kentucky Nature Preserves, dedicated to protecting the Commonwealth's natural heritage, with a primary focus on preserving rare and endangered species habitats.

1.5.2.1.1 Kentucky Division for Air Quality

The KDAQ operates an air monitoring network across the commonwealth to track air quality levels. They collaborate with air pollution sources and the public to create impactful solutions for improving air quality (KEEC, 2022).

- **Air Quality Permits**. Air permitting in Kentucky is governed by the CAA, which requires permits for industrial and commercial sources that release pollutants into the air. These permits provide essential information, including details about the pollutants being emitted, the allowable emission levels, and the necessary steps for pollution reduction. Furthermore, the division handles air permitting for both large sources (referred to as "major" sources) and smaller sources ("minor" or "area" sources). These permits include plans for measuring and reporting air pollution emissions. It is important to note that air permitting in all counties except Jefferson falls under the jurisdiction of the KDAQ.

1.5.2.1.2 Kentucky Division of Water

The KDOW monitors groundwater and surface water in the Commonwealth of Kentucky. The following permits are regulated by the KDOW:

- **401 Water Quality Certification**. The EPA has delegated authority to Kentucky to issue a CWA 401 WQC for projects that require a 404 permit. A 401 WQC is verification by the Commonwealth that the GMPEF would not degrade State Waters or violate water quality standards. This certification or a waiver is required to be submitted to NRC prior to issuing a license.
- **Kentucky Pollutant Discharge Elimination System**. The authority to issue National Pollutant Discharge Elimination System permits has been delegated to the KEEC by the EPA. The KPDES is the State's regulatory program that oversees the issuance of these permits. Below is an overview of KPDES permits:
  - KPDES General Permit for Construction Stormwater Management. Required for all stormwater discharges from construction activities that will disturb 1 or more total acres of land. The General Permit requires the development of a Storm Water Pollution Prevention Plan prior to submitting a Notice of Intent for permit coverage.
  - KPDES Individual Permit for Industrial and Sanitary Wastewater Treatment (operation). Required when discharge from a point source flows into WOTUS. This permit includes monitoring and reporting requirements.
  - Construction Permit for Wastewater Treatment Plant. Required prior to start of construction on a wastewater collection system and wastewater treatment plant. Prior to issuing a construction permit, KDOW reviews plans and specifications with respect to sanitary features of design.
  - Application to Construct Across or Along a Stream/Floodplain Permit. Any type of development in, along, or across a stream requires a stream construction/floodplain permit from the KDOW.

Typical activities requiring a permit include, but are not limited to, residential and commercial structures, stream crossings, fill, stream alterations and relocations, excavation, grading, and small stream impoundments.

- **Groundwater Protection Plan.** Required for activities that have the potential to pollute groundwater. The plan will define best management practices to protect groundwater.

1.5.2.1.3 Kentucky Division of Waste Management

The Hazardous Waste Branch Administrative Support Section is responsible for managing the hazardous waste generator registrations and annual reports for the Commonwealth of Kentucky. The following are RCRA permits/programs implemented by the Hazardous Waste Branch that would apply during GMPEF operations:

- **Hazardous Waste Generator Identification Number Requirement.** Most hazardous waste generators are required to obtain an EPA identification number from the State. This number is site-specific and obtained by filling out the Hazardous Waste Form 8700 RCRA Form, also known as eForm #108, which combines the EPA 8700 Form and the associated Kentucky addendum forms. This eForm is used for both generator registrations and annual reports.
- **Hazardous Waste Management Treatment, Storage, and Disposal Facility Permit.** This permit is for the operation of a treatment, storage, or disposal facility for the management of hazardous waste. Often called a Treatment, Storage, and Disposal Permit, this permit is obtained from EPA.
- **Hazardous Waste Transporter Identification Number Requirement**. Transport of hazardous waste requires an EPA identification number, which would be obtained from the State. This number is operator specific. Receipt of an identification number requires compliance with all applicable DOT regulations (49 CFR 171-179, *Pipeline and Hazardous Materials Safety Administration Department of Transportation*) (see Section 1.5.1.3, *U.S. Department of Transportation*).

Because the PGDP (now the "Paducah Site"), which is adjacent to the GMPEF Site, was designated by the EPA as a Superfund site in 1988, the KDWM developed a PGDP Section to provide independent and regulatory oversight of the cleanup of the PGDP Site and functions as Kentucky's representative in the Federal Facility Agreement. The agreement is a three-party agreement between DOE, EPA, and Kentucky to ensure compliance with and to avoid duplication between the corrective action provisions of the RCRA permitting program and the corrective action requirements of the Comprehensive Environmental Response, Compensation, and Liability Act. The PGDP Section also oversees the Agreement in Principle (AIP) Program funded by DOE. The fundamental goal of the AIP Program is to allow Kentucky to conduct independent and impartial assessments of the potential environmental impacts of DOE activities at the PGDP. Under the AIP Program, Kentucky manages independent environmental monitoring by either conducting or overseeing independent environmental research. Additionally, the program enhances communications with concerned citizens. AIP sampling includes the collection of groundwater samples (at the request of nearby property owners) from private residential wells to inform the public and DOE of current groundwater conditions. AIP personnel send environmental media samples (primarily groundwater) and biological samples from animals to independently validate DOE's sampling results.

1.5.2.1.4 Kentucky Radioactive Materials Program

The Radioactive Materials Program, within the Radiation Health Branch of the Department for Public Health, inspects and issues licenses to radioactive materials users in Kentucky. The program also assists with oversight of radioactive materials and waste transportation throughout the State.

- **Radioactive Materials License**. This license covers the receiving, possession, use, transfer, acquiring of, or ownership of radioactive material. The completed application must be filed with Radiation Health Branch, Cabinet for Health and Family Services.

1.5.2.1.5 Kentucky Fish and Wildlife Commission

The Kentucky Fish and Wildlife Commission works in coordination with the USFWS on the protection of Threatened and Endangered Species and implementation of the ESA.

1.5.2.1.6 Office of Kentucky Nature Preserves

The Office of Kentucky Nature Preserves (KNP) is dedicated to the protection of Kentucky's natural heritage, with the primary focus of protecting threatened and endangered species habitat. KNP works in partnership with NatureServe, the international natural heritage network that monitors biodiversity of plants, animals, ecological communities, and other natural features. The primary source of information for the Kentucky Natural Heritage Database is inventories conducted by KNP biologists and other scientists to gather information on the distribution, abundance, and life history of flora, fauna, and natural communities in Kentucky. This information is used to determine which species and natural communities in Kentucky are the most vulnerable to decline and eventual extinction. This is also the basis for KNP activities such as development of the State listing of rare species, identification of sites of biological significance, and public and technical educational materials. Additionally, the database is utilized to conduct environmental reviews in an effort to reduce impacts from various types of projects. Federal and State agencies, private consultants, nonprofits, and citizens also utilize products generated by KNP, such as the Kentucky Biological Assessment Tool (e.g., KyBAT), to assist them in making informed decisions about proposed activities throughout the State.

1.5.2.1.7 Kentucky Division of Forestry

The mission of the Kentucky Division of Forestry is to protect, conserve and enhance the forest resources of Kentucky through a public informed of the environmental, social and economic importance of these resources. The mandates carried out by the division can be viewed in detail in the Kentucky Revised Statutes Chapter 149.00 Forestry. This statute pertains to forest conservation, information and education, commercial timber harvesting operations, master logger training, forest fire prevention, fire hazard seasons, establishment of a statewide system of forest fire protection, establishment of blight-resistant chestnut tree seedlings, maintenance of the State nurseries, management of State-owned forests, and forest pest control among others.

1.5.2.2 *Kentucky Heritage Council*

An agency of the Kentucky Tourism, Arts and Heritage Cabinet, the Kentucky Heritage Council (KHC) serves as the State Historic Preservation Office and is responsible for the identification, protection, and preservation of prehistoric resources and historic buildings, along with sites and cultural resources throughout Kentucky. KHC programs include:

- Finding, surveying, and documenting historic buildings and sites.
- Making nominations to the National Register of Historic Places.
- Administering Federal and State historic rehabilitation tax credit programs.
- Conducting archaeological research and education.
- Reviewing impacts of Federal projects as mandated through Section 106 of the NHPA.

- Working with local governments and preservation commissions, conducting preservation education and planning, and administering the Certified Local Government Program in partnership with the National Park Service.
- Administering the Kentucky Main Street Program.
- Providing administrative support to the Kentucky African American Heritage Commission, Kentucky Native American Heritage Commission, Kentucky Military Heritage Commission and Perryville Battlefield Commission.

Serving as the State Historic Preservation Office, KHC reviews archaeological surveys conducted to identify and evaluate the significance of archaeological remains that may be damaged or destroyed by an action. If a Federal undertaking is in conflict with the preservation of a historic property, KHC seeks to eliminate or minimize the effect on the property through mitigation procedures.

1.5.2.3 *Kentucky Office of State Archaeology*

A part of the University of Kentucky Department of Anthropology, the Kentucky Office of State Archaeology issues archaeological site numbers and maintains records of recorded archaeological sites and surveys in the State. It is also responsible for issuing permits to excavate and remove artifacts from State-owned land or other land controlled by the State or its entities. The office operates under Kentucky legislation Kentucky Revised Statutes 164.705 through 164.735.

1.5.2.4 *Kentucky Transportation Cabinet*

The Kentucky Transportation Cabinet requires a driveway permit for entrances and other correlated roadway modifications. The policy and procedures for these permits can be found in its Permits Manual.

1.5.3 Consultations and Authorizations

GeM is establishing an implementation plan and schedule to comply with the regulatory requirements, permits, and required consultations described in this section. No administrative delays or other problems preventing agency consultation, review, approval, or authorization are anticipated. In advance of submission of this ER, GeM has begun consulting with the responsible agencies in compliance with the following:

- Section 404 of the CWA, Jurisdictional Determination of WOTUS (USACE)
- Section 7 of the ESA (USFWS)
- Section 106 of the NHPA (KHC)
- Encroachment permits and Traffic Impact Study (Kentucky Transportation Cabinet)

2.0 ALTERNATIVES

2.1 Description of the Alternatives

This section describes the Proposed Action described in Section 1.4, *Proposed Action*, as well as alternatives. The range of alternatives considered is consistent with the underlying need for and purpose of the Proposed Action, as set forth in Section 1.2, *Purpose and Need for the Proposed Action*. Accordingly, the range of alternatives considered is based on the underlying need for additional reliable and economical uranium enrichment capacity in the United States (U.S.) as would be provided by the proposed General Matter Paducah Enrichment Facility (GMPEF). The alternatives considered in detail include (1) the No Action Alternative under which the proposed GMPEF would not be built and (2) the Proposed Action to issue a U.S. Nuclear Regulatory Commission (NRC) license to General Matter, Inc. (GeM) for the construction and operation of the GMPEF.

This chapter also addresses the alternatives that were considered but ultimately eliminated from detailed consideration. Finally, this chapter presents, in tabular form, a comparison of the potential environmental impacts associated with the Proposed Action and the No Action Alternative.

2.1.1 No Action Alternative

Under the No Action Alternative, the NRC would not issue a license to construct and operate the proposed GMPEF, and the facility would not be built. Therefore, the No Action Alternative would negatively impact the availability of additional reliable and economical domestic sources of enriched uranium and would result in a failure to meet the following needs:

- **The need for enriched uranium to fulfill nuclear electrical generation requirements.** As described in Section 1.3, *Market Analysis*, the International Energy Agency (IEA) predicts that global nuclear electricity generation will increase by about 32 percent from 2025 to 2035 (IEA, 2024). The U.S. Department of Energy (DOE) considers nuclear power as "the only proven technology that can provide abundant supplies of base-load electricity reliably and without air pollution or emissions of greenhouse gases" (CRS, 2007).
- **The need for domestic uranium-enrichment capacity for national energy security.** National energy security policy objectives include the addition of reliable and economical domestic sources of enriched uranium, furthering both U.S. energy security objectives by providing domestic uranium enrichment capacity and lessening U.S. dependence on foreign sources of enriched uranium. In 2023, about 73 percent of U.S. demand was supplied by foreign sources (IEA, 2024).

The No Action Alternative would result in no additional environmental impacts to the area around the Paducah Site. Current levels and/or projections of land development, groundwater and surface water availability and quality, and air emissions and quality, would remain the same. There would be no additional impacts to the ecology, floodplains, wetlands, historical and cultural resources, public and occupational health, waste management, or visual/scenic conditions. Under the No Action Alternative, the area around the Paducah Site would not benefit from the expected beneficial impacts of the Proposed Action on employment, income, and tax revenues during the construction, operation, and decommissioning phases.

2.1.2 Proposed Action

This section provides a description of the Proposed Action, including a summary of construction, operation, and decontamination and decommissioning (D&D). See Appendix A, *Facility Description*, for more detail.

2.1.2.1 *Description of the Proposed Action*

The Proposed Action is the issuance of a license to construct and operate a uranium-enrichment facility on land adjacent to the existing DOE Paducah Site near Paducah, Kentucky, in accordance with 10 *Code of Federal Regulations* (CFR) 70 (*Domestic Licensing of Special Nuclear Material*); and other applicable laws and regulations. The corporate identities of the organization sharing ownership of the Proposed Action are more fully described in Chapter 2 of the License Application, *Organization and Administration*.

The Proposed Action includes the construction, operation, and D&D of the following facilities within the GMPEF Project Area (see Figure 1-3):

- Component Assembly Buildings,
- Operations Support Building,
- Two Production Halls (Production Halls A and B) with a production capacity of several million Separative Work Units (SWUs) that could be used in any combination of enrichment configurations,
- Central Utilities Building, and
- Switchyard.

Buildings would resemble typical industrial/warehouse buildings. Maximum building height is expected to be 72 feet. During construction, the tallest construction equipment would likely be cranes at approximately 300 feet. Outdoor lighting would be shielded to minimize impacts to surrounding users and to comply with applicable regulations. In addition, options exist to connect an access road to Hobbs Road, if approved by DOE.

Outside the GMPEF Site, there would be the following utility connections:

- The DOE Paducah Site water distribution system supply line on Hobbs Road or available municipal water sources near the DOE Paducah Site;
- The DOE Paducah Site sanitary sewer system line on Hobbs Road or available municipal sewer near the DOE Paducah Site;
- The DOE natural gas line south of the cylinder storage yard. Natural gas is supplied by Atmos Energy; and
- The existing electrical lines at the new GMPEF substation. [redacted](Trade Secret / Confidential Commercial Information)

The construction of the GMPEF is expected to require 2 years. The GMPEF would be initially licensed for 40 years of operation and would subsequently receive up to two potential 20-year license renewal periods or be decommissioned. The following is a tentative list of Proposed Action milestones:

- 2025 and 2026 – Site clearing and preparation, utility install, and grading/earthwork
- 2026 – Construction start (for systems, structures, and components with no nexus to radiological safety)
- 2026 – Submit NRC Part 70 license application
- 2027 – NRC license issuance
- 2028 – Initial Construction Completion
- 2028 – Commissioning of Production Hall A
- 2029 – Commissioning of Production Hall B
- 2067 – End of initial 40-year license
    - 2067 to 2069 – D&D

- If license renewed: 2107 – End of renewal term
  - 2107 to 2109 – D&D

2.1.2.1.1 Construction Activities

The GMPEF would be built on land owned by DOE and would be consistent with the site's current Heavy Industry Zone zoning classification (DOE, 2025a). The construction workforce is estimated at 600 employees working one 10-hour shift per day, 6 days per week.

Construction

In 2026, DOE issued an *Environmental Assessment (EA) for General Matter's Site Preparation and Licensing Activities in Parcel A of the Paducah Site in McCracken County, KY* (DOE/EA-2327). This EA analyzed the environmental impacts to complete site preparation activities and to license, construct, operate, and eventually decommission essential radiological and nonradiological auxiliary facilities within Parcel A. These facilities included:

- Administrative and Security Building
- Warehouse Building
- Central Utilities Building
- Access Roads
- Parking Lots
- Equipment Storage Pads
- Depleted-up-to-Natural UF_6 cylinder storage pads

GeM is proposing to additionally construct the following structures on the GMPEF parcels:

- Parcel A (approximately 100 acres)
  - Component Assembly Buildings
  - Operations Support Building
  - Two Production Halls (Production Halls A and B) with a production capacity of several million SWUs that could be used in any combination of enrichment configurations
  - Central Utilities Building
- Parcel C (approximately 6.8 acres)
  - Switchyard

New aboveground electrical utility lines will connect the GMPEF to a new electrical substation as shown on Figure 1-3. The electrical substation would receive 161 kilovolt (kV) power and would distribute 34.5 kV power to the GMPEF. Major substation structures would include open-air electrical bus, transformers, and prefabricated switchgear enclosure. The existing DOE Paducah Site water system would provide water during construction and operations. A potable water supply line would be run from the existing water line along Hobbs Road. In the future, GeM may connect to the local utility, Paducah Water, to provide water to the facility. The GMPEF would require approximately 24.4 million gallons per year (gpy) of water during construction.

Sanitary water would be discharged to the existing DOE Paducah Site sanitary wastewater system. A sanitary sewer line would be run to the existing sewer line along Hobbs Road. Utility lines would likely follow existing or proposed roadways to minimize environmental impacts.

GeM will obtain Kentucky Pollutant Discharge Elimination System (KPDES) permit coverage for two additional outfalls to Bayou Creek and Little Bayou Creek (see Figure A-6). Stormwater runoff would then be conveyed to the new permitted outfalls. New outfalls will be constructed during the construction phase of the Proposed Action activities. GeM plans to submit permit applications for the new outfalls to the Kentucky Department of Environmental Protection by the end of 2026. The GMPEF will also have onsite stormwater retention basins. See Section 4.5.2, *Surface Water Impacts*, for details on how stormwater would be managed for the Proposed Action.

A short access road to the GMPEF Site from Hobbs Road would be built, if approved by DOE. Required permits and other regulatory approvals discussed in Section 1.5, *Applicable Regulatory Requirements, Permits, and Required Consultations*, would be obtained during preoperational construction activities.

2.1.2.1.2 Operational Activities

Operations at the GMPEF would involve receiving natural uranium feed materials (i.e., UF_6) from various sources (e.g., the Honeywell facility in Metropolis, Illinois, and the Cameco facility in Port Hope, Ontario, Canada) and depleted uranium tails (DUF_6) from the DOE Paducah Site. Additionally, some uranium feed materials could be supplied from overseas sources and arrive at ports in Baltimore, Maryland, or Portsmouth, Virginia. Materials would be transported to the GMPEF Site via trucks and would arrive at the GMPEF access road along Hobbs Road via Kentucky Route 60 (KY-60) or along Dyke Road and Hobbs Road directly from the Paducah Site.

GeM enrichment technology would be used to enrich uranium feed material into UF_6 product streams of natural or enriched to up to 20 percent uranium-235 (U-235) (i.e., high-assay, low-enriched uranium [HALEU]) and a DUF_6 stream. The GeM enrichment process is further defined in Appendix A, *Facility Description*.

The low-enriched uranium (LEU) and HALEU product would be transported by truck to fuel manufacturing facilities, such as the ones in Wilmington, North Carolina; Columbia, South Carolina; and Richland, Washington.

DUF_6 from GMPEF operations enriching natural uranium would be stored on site, then transported by truck to one of DOE's DUF_6-conversion facilities at Paducah, Kentucky, or Portsmouth, Ohio; or to a commercial DUF_6 conversion facility, should one become available. Secondary tails from operations enriching DUF_6 tails from the DOE Paducah Site would be returned to the Paducah Site. LLRW generated by GMPEF operations would be shipped to the Energy*Solutions* disposal facility in Clive, Utah, or another commercial LLRW disposal facility (see Section 4.3.3.2, *Transportation Modes, Routes, and Distances*).

2.1.2.1.3 Decontamination and Decommissioning

A Decommissioning Funding Plan is included as part of the GeM license application in accordance with 10 CFR 70.25 (*Financial Assurance and Recordkeeping for Decommissioning*). The plan demonstrates financial capability to support decommissioning and closure activities. In accordance with 10 CFR 70.25(f)(2), financial assurances would be provided by GeM through a company guarantee.

Before decommissioning activities begin, a Decommissioning Plan would be prepared and submitted to the NRC pursuant to 10 CFR 70.38 (*Expiration and Termination of Licenses and Decommissioning of Sites and Separate Buildings or Outdoor Areas*). The Decommissioning Plan would provide information concerning the GMPEF, the types of items to be decontaminated, the disposition of facilities used for radiological materials, the assumptions upon which the cost of decommissioning is derived, and an estimated schedule for decommissioning and closing the GMPEF. It is the intent of GeM to eventually decommission and close the GMPEF so as to reduce the level of radioactivity remaining in the facility to residual levels acceptable for release of the GMPEF Site to achieve release of the site for NRC license

termination and unrestricted land use pursuant to 10 CFR 20.1401 (*General Provisions and Scope*) and 10 CFR 20.1402 (*Radiological Criteria for Unrestricted Use*).

Prior to decommissioning, an assessment of the radiological status of the GMPEF would be made. D&D and closure activities would include the cleaning and removal of radioactive and hazardous constituent contamination that may be present on materials, equipment, and structures. Decommissioning activities will include:

- Removal of [redacted] (Trade Secret / Confidential Commercial Information) process equipment,
- Decontamination or demolition of radiological structures,
- Management of LLRW and mixed waste,
- Final status surveys,
- Environmental and radiological verification, and
- Coordination with DOE for turnover of land or supporting structures.

Further, the DOE lease specifies the end state for the property after decommissioning (DOE, 2025a).

2.1.2.2 *Site and Facility Information*

This section presents a description of existing facilities at the proposed GMPEF Site, as well as a description of the Proposed Action facilities and operations, including a description of the Proposed Action process design and a description of materials use, storage, and disposal. More detailed information can be found in Appendix A, *Facility Description*.

2.1.2.2.1 Existing Facilities at Proposed GMPEF Site

As of the date this ER is submitted, no existing facilities at the proposed GMPEF Site exist except for the high voltage transmission lines and a cylinder storage pad. The approximately 10-acre UF_6 cylinder storage yard (C-745-T Cylinder Storage Yard) is constructed of concrete with a thickness of approximately 14 inches.

However, DOE issued the *Environmental Assessment for General Matter's Site Preparation and Licensing Activities in Parcel A of the Paducah Site in McCracken County, KY* in summer 2026 (DOE/EA-2327). This EA analyzed the environmental impacts to complete site preparation activities and to license, construct, operate, and eventually decommission essential radiological and nonradiological auxiliary facilities at the GMPEF Site. The construction of these facilities is expected to take less than 1 year. Therefore, in addition to the facilities already identified, the following buildings may be present at the time of subsequent NEPA analysis:

- Administrative and Security Building
- Warehouse Building
- Central Utilities Building
- Access Roads
- Parking Lots
- Equipment Storage Pads
- Depleted-up-to-Natural UF_6 cylinder storage pads

2.1.2.2.2 Proposed GMPEF and Operations

During operation of the Proposed Action, the GMPEF would occupy most of the approximately 107 acres of the GeM Land Parcel. Figure 1-3 shows the GMPEF conceptual site layout. The GeM Land Parcel spans

between latitudes (North) 37° 5' 48.9" and 37° 6' 13.8", and between longitudes (West) 88° 49' 10.9" and 88° 48' 20.5", and is approximately 10 miles west of the City of Paducah in McCracken County, Kentucky. The operations workforce is estimated to be approximately 140 employees composed of approximately 100 process employees, split into 4 groups of 25 to cover 3 rotating shifts and approximately 40 corporate staff working the weekday (daytime) shift.

Within the GMPEF there would be two enrichment halls (Production Halls A and B), one would be approximately 650,000 square feet and the other would be approximately 490,000 square feet. An approximately 35,000-square foot Operations Support facility would contain the following support functions:

- Offices and training areas for radiological operations employees.
- Emergency Operations Center that doubles as a break room.
- Meeting rooms.
- Control Center, containing a Control Room to serve as the main point of monitoring and control for enrichment buildings. The Control Room would contain control workstations with desks and screens, fire and safety alarm systems, and communications systems. [redacted] (Security-Related Information)
- Radiation Control Point and Monitoring Room to be used for contamination monitoring equipment, handwashing facilities, safety showers, and access controls to separate non-contaminated and potentially contaminated areas of the facility.
- Labs (Materials Testing and Equipment, Calibration, and Tool Crib).
- Workshops (Electrical Shop, Instruments and Control Shop, and Mechanical Maintenance Shop).

The GMPEF would be connected to an aboveground power line, and underground natural gas, potable water, and sanitary sewer pipelines. The GMPEF would require approximately 265 million gpy of water during operations. The GMPEF would generate approximately 10,000 gallons per day (gpd) of sanitary wastewater during operations. Waste treatment is described in Section 2.1.2.2.2.2, *Materials Use, Storage, and Disposal*, and Section 4.13.1.2.1, *Wastewaters*.

2.1.2.2.2.1 Process Design for the GMPEF

The GMPEF would utilize industry-standard 48Y and 30B UF6 containers and processes for material handling aspects of enrichment facility operations similar to those utilized at other uranium-enrichment facilities. [redacted] (Trade Secret / Confidential Commercial Information). The result is a UF6 product stream enriched in the U-235 isotope and a DUF6 stream in which the fraction of U-235 isotope is reduced or depleted. The two resulting streams would be separately collected in cylinders and temporarily stored on site at the cylinder storage pads prior to use, transport to a fuel fabrication facility, return to DOE, or disposal.

2.1.2.2.2.2 Materials Use, Storage, and Disposal

The GMPEF would use a variety of non-hazardous and hazardous chemicals and materials and generate waste. Many GMPEF support functions, including utilities, materials, and services, would be typical of

those required for any chemical processing plant. Waste streams are expected to be relatively small and typical of other UF_6-handling facilities and would be addressed by conventional means. [redacted] (Trade Secret / Confidential Commercial Information). Additional details regarding specific buildings and areas that would be used for chemical use and storage and waste management are presented in the GMPEF NRC license application (Chapter 6, *Chemical Process Safety*, and in Chapter 8, *Emergency Management*) prepared for the Proposed Action.

Construction of the GMPEF would generate solid waste materials that would need to be collected and transported off site for recycling or disposal. No radioactive waste is anticipated to be generated as a result of construction.

Section 4.13, *Waste Management Impacts*, provides details about waste management procedures as they would apply to operation of the GMPEF, a summary of which is as follows:

- Operation of a collection system for radioactive liquid wastewaters (i.e., the Liquid Effluent Collection System), and shipping of the radioactive liquid off site for treatment and disposal.
- Sanitary water would be discharged to the DOE Paducah Site sanitary sewer system and treated at the C-615 Sewage Treatment Plant prior to discharge through an existing approved DOE KPDES outfall.
- Disposal of GMPEF non-hazardous municipal solid waste at a permitted local municipal solid waste landfill.
- Delivery of non-hazardous industrial waste to permitted recycling or waste management facilities, for recycling, or treatment and disposal, depending on the waste composition.
- Disposal of Resource Conservation and Recovery Act (RCRA) hazardous waste at an RCRA-permitted treatment, storage, and disposal facility.
- Secondary tails will be transferred back to the DOE Paducah Site after processing. Temporary onsite storage of DUF_6 from natural enrichment will occur at the cylinder storage area for ultimate acceptance by DOE for disposal, in accordance with Section 3113 of the United States Enrichment Corporation, Inc. Privatization Act (42 United States Code [U.S.C.] 2297h-11), or to a commercial DUF6-conversion facility, should one become available.
- Disposal of LLRW generated by GMPEF operations at the EnergySolutions disposal facility in Clive, Utah, or other permitted LLRW management facility.

GeM will obtain KPDES permit coverage for two additional outfalls to Bayou Creek and Little Bayou Creek (see Figure A-6). Stormwater runoff would then be conveyed to the new permitted outfalls. New outfalls will be constructed during the construction phase of the Proposed Action activities. GeM plans to submit permit applications for the new outfalls to the Kentucky Department of Environmental Protection by the end of 2026. The GMPEF will also have onsite stormwater retention basins constructed as part of the Proposed Action. Section 4.5.2, *Surface Water Impacts*, presents more details on stormwater management.

2.1.2.3 *Impacts from Performing the Proposed Action*

Reasonably foreseeable environmental impacts and the extent of those impacts from the Proposed Action, are described in detail in the resource-specific sections of Chapter 4.0, *Environmental Impacts*. Table 2-1 presents a summary of the potential environmental impacts of the Proposed Action compared to the No Action Alternative. This ER uses the standard of significance established by the NRC in Nuclear Regulatory Commission Report (NUREG)-1748, (*Environmental Review Guidance for Licensing Actions Associated with NMSS Programs*) (NRC, 2003) which is used to define impacts as follows:

- SMALL: The environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
- MODERATE: The environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
- LARGE: The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

Under the NRC system, no or negligible impacts would be considered SMALL.

The types and magnitudes of environmental impacts for the Proposed Action would vary during GMPEF construction, operation, and decontamination and decommissioning. In general, unavoidable residual adverse impacts for the Proposed Action after implementation of mitigation measures would be SMALL, with the exception of MODERATE impacts for transportation, soils, surface water resources, ecological resources, visual resources, and waste management. Many of these impacts would occur on a localized or temporary basis (i.e., at or in the immediate vicinity of the GMPEF Site or only during the 2-year construction period). Even without mitigation, no LARGE adverse environmental impacts are identified for the Proposed Action.

2.1.2.4 *Potential Mitigation Measures*

Potential mitigation measures to reduce impacts from the Proposed Action and associated potential restoration actions, if applicable, are discussed in Chapter 4.0, *Environmental Impacts*, and further described in Chapter 5.0, *Mitigation Measures*. Mitigation measures are "Actions and decisions that: (i) avoid impacts altogether by not taking a certain action or parts of an action; (ii) minimize impacts by limiting the degree or magnitude of an action; (iii) rectify the impact by repairing, rehabilitating, or restoring the affected environment; (iv) reduce or eliminate the impact over time by preservation and maintenance operations during the life of the action; or (v) compensate for an impact by replacing or providing substitute resources or environments" (NRC, 2003).

2.1.2.5 *Proposed Monitoring*

In accordance with the Radiation Protection regulations in 10 CFR Part 20, the NRC requires that licensees perform the measurements and monitoring necessary to demonstrate compliance with these regulations and to demonstrate that the amount of radioactive material present in effluent from a facility has been kept As Low as Reasonably Achievable (ALARA). In addition, pursuant to 10 CFR 70.59 (*Effluent Monitoring Reporting Requirements*), the NRC requires that licensees submit semiannual reports specifying the quantities of the principal radionuclides released to unrestricted areas and other information needed to estimate the annual radiation dose to the public from effluent discharges. The NRC has also issued Regulatory Guide 4.15, *Quality Assurance for Radiological Monitoring Programs (Normal Operations)—Effluent Streams and the Environment* (NRC, 2007) and RG 4.16, *Monitoring and Reporting Radioactivity in Releases of Radioactive Materials in Liquid and Gaseous Effluent from Nuclear Fuel Processing and Fabrication Plants and Uranium Hexafluoride Production Plants* (NRC, 2010), which reiterate that concentrations of hazardous materials in effluent must be controlled and that licensees must adhere to the ALARA principle such that there is no undue risk to the public health and safety at or beyond the site boundary.

Chapter 6.0, *Environmental Measurements and Monitoring Programs*, describes environmental baseline measurements and subsequent monitoring as applicable to construction, operation, and decommissioning of the GMPEF. See Table 6-1 for a summary of the GeM Environmental Monitoring Program. Since the GMPEF would be located next to the DOE Paducah Site, the Environmental Monitoring Program was developed considering past experience and ongoing monitored efforts conducted by DOE

and the State of Kentucky. The existing DOE Paducah Site Environmental Monitoring Program would be leveraged to the extent possible to inform monitoring required for the Proposed Action. As discussed in Chapter 6.0, and as summarized in Table 6-1, in addition to nearby locations currently monitored by DOE and the State of Kentucky, sampling locations specific for the Proposed Action have been established to monitor for the following:

- Direct radiation (see Figure 6-1)
- Air quality (see Figure 6-1)
- Radiological Operations Support Building stacks
- Groundwater (see Figure 6-2)
- Baseline soil (see Figure 6-3)

As discussed in Section 2.1.2.5, *Proposed Monitoring*, and Section 6.1, *Radiological Monitoring*, groundwater monitoring wells would be installed within the GMPEF Project Area and soil boring locations would be established as part of preoperational activities. Baseline sampling of soil would be conducted before the GMPEF is constructed and baseline groundwater quality sampling would be conducted before the GMPEF becomes operational. Results from the existing DOE Paducah Site monitoring program would serve as baseline measurements for air, stormwater, treated sanitary wastewater effluent, surface water, and sediment, therefore, additional activities for assessments of baseline conditions would not be required for these media. During GMPEF construction, air monitoring would be conducted to verify whether dust suppression practices are sufficiently effective, and stormwater monitoring would be conducted to verify whether measures prescribed in the Storm Water Pollution Prevention Plan are implemented as required by the KPDES permit.

2.2 Alternatives Considered but Eliminated

Evaluations were performed for alternatives to the Proposed Action regarding technology, facility design, site location, and facility location. This section describes the evaluations and the resultant elimination of these alternatives from further consideration. Much of this information was reproduced from the PLEF ER (GLE, 2025).

2.2.1 Elimination of Technology Alternatives

[redacted] (Trade Secret / Confidential Commercial Information)

[redacted]

[redacted] (Trade Secret / Confidential Commercial Information)

[redacted]

[redacted]

(Trade Secret / Confidential Commercial Information [redacted]

[redacted]

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[redacted]

[redacted]

[redacted]

[redacted]
(Trade Secret / Confidential Commercial Information
[redacted]

2.2.2 Elimination of GMPEF Design Alternatives

The GMPEF could be designed in a multitude of different designs and configurations. Through a GMPEF design-optimization process, several design alternatives were eliminated from further evaluation based on consideration of the following factors:

- Environmental impacts
- Contamination of facility structures (i.e., non-environmental)
- Ease of decommissioning
- Waste minimization
- Emergency response
- Uranium separation efficiency

An example of the design and engineering review to reduce environmental impacts of the GMPEF is the decision to limit the height of the buildings. This design optimization reduces the visual impact of the buildings and makes the buildings safer to construct and operate.

In accordance with 10 CFR 20.1406 (*Minimization of Contamination*), the GMPEF was designed to minimize contamination of the facility, minimize waste generation, and facilitate eventual decommissioning. The facility was designed to minimize the amount of liquid waste. Waste storage options such as in-ground tanks were avoided to minimize the difficulty of decontamination during the decommissioning phase. Therefore, because building design is developed using an optimization process, alternative to building design were not considered in this ER.

2.2.3 Elimination of Site Alternatives

There are many sites across the United States where the GeM enrichment facility could be located. The objective of the GMPEF Site-selection process was to identify the preferred site for the construction and operation of the GMPEF. GeM closely evaluated over 30 sites on the following criteria:

- Existing environmental characterization and resource conflicts
- Natural hazard risk
- Utility availability
- Community and government support
- Nuclear workforce availability
- Workforce development support (including trade school, community college, and university systems)

After reviewing the data for the 30 sites, GeM selected Paducah for three main reasons:

- **Operational Synergies and Local Support:** Co-location with other DOE-related and nuclear supply chain activities enables shared services, workforce continuity, and established vendor relationships.

The local community has decades of experience supporting enrichment activities, providing a stable, skilled labor pool and strong stakeholder backing.

- **Speed and Cost-Effectiveness:** Leveraging the existing DOE Paducah Site infrastructure dramatically shortens the timeline to deployment compared to a greenfield build. Proximity to utilities, transport access, and workforce reduces both initial capital costs and schedule risk. Reuse of utilities, security systems, and site services reduces investment needs.
- **Regulatory and Environmental Risk Reduction:** The DOE Paducah Site has an extensive history of uranium enrichment operations, with substantial historical baseline environmental data and regulatory precedents already in place. This allows GeM to leverage pre-existing environmental documentation to streamline ER preparation and project approvals, reducing uncertainty in licensing and permitting. The well documented site with environmental baselines significantly lowers the risk of unexpected permitting delays or additional mitigation requirements.

2.2.4 Elimination of Location Alternatives

There are a number of areas within and adjacent to the DOE Paducah Site where the GeM enrichment facility could be located. The 107-acre parcels (100 acres of Leasing Parcel A and 6.8 acres of Leasing Parcel C) on the south side of the DOE Paducah Site was mutually selected by the DOE Office of Environmental Management and GeM due to several factors. These factors include:

- **Known Environmental Conditions**. The parcel has a substantial historical baseline of environmental data. Cultural, environmental and radiological studies have been performed on the parcel spanning several decades. There was high confidence that the site did not contain significant cultural artifacts, sensitive natural resources or radiological/hazardous material contamination. Also, the site did not contain delineated wetlands and was not above known groundwater contamination. In addition, the site was relatively flat and was not in a floodplain.
- **Proximity to the Existing Cylinder Storage Yards.** Given that GeM plans to re-enrich DUF_6 currently stored at the Paducah Site, GeM determined that the location adjacent to a cylinder storage yard was the most suitable option, and that this location would reduce the necessity for transportation of DUF_6 cylinders on public roads.

2.3 Comparison of the Reasonably Foreseeable Environmental Impacts

As described in Section 2.2, *Alternatives Considered but Eliminated*, evaluations were performed for alternatives to the Proposed Action regarding technology, facility design, site location, and facility location, and the results of these evaluations eliminated these alternatives from further consideration. Therefore, the comparison presented in this ER is that of the Proposed Action, under which the GMPEF would be constructed and would enrich Depleted-up-to-Natural UF_6, and natural UF_6 to LEU, and LEU to HALEU while minimizing potential adverse environmental impacts, against the No Action Alternative, under which the GMPEF would not be constructed. Reasonably foreseeable environmental impacts from the Proposed Action and potential mitigation measures, if applicable, are described in detail in the resource-specific sections of Chapter 4.0, *Environmental Impacts*. Table 2-1 presents a summary of the potential environmental impacts of the Proposed Action as compared against the No Action Alternative. Table 2-2 shows the comparison between the potential impacts for the Proposed Action and the No Action Alternative regarding domestic capacity and supply.

2.4 Cumulative Effects

Cumulative effects (also referred to as impacts) result from the incremental impact of an action when added to other actions. These other actions can include past, current, or reasonably foreseeable future

actions. Past, current, and reasonably foreseeable future industrial and non-industrial activities were evaluated for potential cumulative impacts when combined with the Proposed Action:

- **Cumulative effects across lifecycle phases.** These are cumulative impacts resulting from activities during construction, operation, and/or D&D of the GMPEF.
- **Cumulative effects with other onsite or offsite adjacent facilities or activities.** Facility activities that may result in cumulative effects with the activities of the GMPEF, such as:
  - **Existing projects at the DOE Paducah Site.** The current facilities at the DOE Paducah Site are considered in the evaluation of cumulative impacts.
  - **Additional planned projects for the vicinity**. This includes the PLEF planned to be constructed and operated to the south of the GMPEF Site (NRC, 2026), and the DOE turnover of areas to the east of the GMPEF Site for industrial development (DOE, 2025d).
  - **Other offsite industrial development**. There are no known future industrial developments in the vicinity of the GMPEF Site. Correspondence with local planners conducted for the PLEF ER confirms that there are no planned or permitted projects in McCracken County (GLE, 2025).
  - **Offsite residential development**. Phase 2 of development for the Arcadia Pines subdivision, located approximately 4 miles southeast of the GMPEF Site on Red Pine Circle, has received preliminary approval. The developer owns an approximately 35-acre parcel for future development (GLE, 2025).
  - **Offsite transportation**. This could result in a cumulative radioactive dose to the general public from the transportation of UF_6 as feed, product, or depleted UF_6 material, and radioactive waste.
  - **Offsite infrastructure improvement projects**. There are multiple infrastructure improvement projects within 10 miles of the GMPEF Site.
    - The Ohio River Shoreline, Paducah Kentucky Reconstruction Project is located in McCracken County, Kentucky, on the Ohio River, with activities occurring as close as 4 miles from the DOE Paducah Site. The U.S. Army Corps of Engineers (USACE) Louisville District is scheduled to complete Phases 1 and 2 of this project in Fiscal Year 2024 (GLE, 2025; USACE, 2023).
    - Approximately 3.5 miles from the GMPEF Site, the Kentucky Transportation Cabinet (KYTC) is developing engineering design plans for a proposed U.S. Highway (U.S. Hwy) 60 improvement project between Ballard and McCracken Counties. As identified in the Environmental Assessment for the U.S. Hwy 60 project, there are three alternative routes that all would occur within the 5-mile radius of the GMPEF Site (GLE, 2025; KYTC, 2020a).
    - The KYTC is designing a project to widen Friendship Road in Paducah, Kentucky (approximately 7 miles east of the Paducah Site). Phase 1 of the Friendship Road improvement began in 2023 with an unconfirmed timeline for completion (GLE, 2025; KYTC, 2021).
    - McCracken County Sports Tourism Commission submitted for a Department of the Army Permit for a proposed Stuart Nelson Park facility upgrade. This proposed project would contain 5 soccer/multipurpose fields, 5 baseball/softball fields, 2 basketball courts, 16 tennis/pickleball courts, disc golf course, buildings, shelters, and associated infrastructures, which would be constructed approximately 8 miles from the GMPEF Site (GLE, 2025; USACE, 2024).

The cumulative impacts of the facilities and actions described above combined with the Proposed Action are summarized in Table 2-3 and overall, the impacts from the Proposed Action are anticipated to not substantially contribute to cumulative impacts.

To measure the overall effect of the Proposed Action, aggregate benefits and aggregate costs of the GMPEF were examined, including both socioeconomic and environmental effects. Generally, the Proposed Action would be expected to convey positive net benefits, including increased energy security for the United States because of increased domestic supply of enriched uranium; reduced air pollution through enabling the substitution of nuclear power generation in place of fossil-fuel-based power generation; increased employment and income for residents of the Paducah region; and income and revenues generated by operation of the GMPEF. Environmental costs are summarized in Table 2-1.

Table 2-1: Comparison of the Impacts from the Proposed Action and the No Action Alternative

Environmental Category	Proposed Action	No Action Alternative
Land Use	SMALL Tree-clearing activities and grading activities have taken place on approximately 70 acres of the approximately 100-acre site. DOE assessed this activity as subject to an existing CX, as reflected in the CX determination in *Site Preparation Including Tree Clearing (Parcel A) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (CX-270853) and *General Matter, Inc. Site Preparation (Parcel A) at the Paducah Gaseous Diffusion Plant, Kevil, McCracken, Kentucky* (451.1a-093), respectively. The remaining 30 acres of the GMPEF Site were cleared and graded prior to GeM's lease and are now periodically mowed vegetation areas under the transmission line right-of-way. While the Proposed Action would require additional tree clearing and grading of approximately 6.8 acres of presently undeveloped forested land within the proposed switchyard area, the area is currently zoned heavy industrial. The zoning for the site would not change. Therefore, the land use impacts resulting from construction of the GMPEF (i.e., change in land cover) would be SMALL.	No Additional Impact – A uranium-enrichment facility would not be constructed on the GMPEF Site. Existing conditions would remain unchanged.
Transportation	SMALL to MODERATE The radiological exposure (doses) to the public and workers for radioactive shipments would result in SMALL impacts. Increased traffic during construction and operation of the GMPEF could have some adverse impact on the traffic flow and increase the potential for traffic congestion at the Hobbs Road and U.S. Highway 60 intersection during peak commuting hours. Therefore, traffic impacts for construction and operation of the GMPEF on a local basis are anticipated to be MODERATE.	No Additional Impact – Additional motor vehicle traffic would not be added to the levels associated with the Paducah Site. Existing UF_6 radioactive source material, product, and waste transport related to existing fuel fabrication facilities would remain the same.
Geology and Soils	SMALL to MODERATE Bedrock geology is located at a significant depth below the GMPEF Site (>600 feet) and it is not anticipated that construction activities will impact the geology. Rough grading activities have occurred for approximately 100 acres of the GMPEF Site. Approximately 6.8 acres of presently undeveloped forested land would still need to be cleared and graded. Because soils would be stripped from much of the site, and because large soil volumes may be imported to or exported from the site, impacts on soils resulting from construction activities are expected to be MODERATE.	No Additional Impact – No geologic or soil disturbance within the GMPEF Site would occur. Existing conditions would remain unchanged.

Table 2-1: Comparison of the Impacts from the Proposed Action and the No Action Alternative

Environmental Category	Proposed Action	No Action Alternative
Water Resources	SMALL to MODERATE Neither groundwater nor surface water would be withdrawn onsite and there would be no discharge of untreated process or sanitary wastewater. Therefore, impacts to these resources would be SMALL. Current drainage from the GMPEF Site flows east to Little Bayou Creek and its unnamed tributaries and west to Bayou Creek. Due to vegetation removal, grading, and other land-disturbing activities, increased sediment loadings to receiving streams could occur during construction. As such, a KPDES stormwater construction general permit would be required and a Storm Water Pollution Prevention Plan would be produced. Impacts on surface water quality are anticipated to be SMALL.	No Additional Impact – Groundwater conditions would remain unchanged. Surface water conditions would remain unchanged. Floodplain conditions would remain unchanged.
Ecological Resources	SMALL to MODERATE Construction of the GMPEF would directly impact ecological resources via temporary and permanent disturbance, degradation, or loss of habitat from land-clearing activities or disturbance or displacement of wildlife due to an increase in noise and human activity. Impacts could also include fragmentation of remaining habitats resulting from project developments and increases in human-wildlife interactions (such as encounters and collisions between wildlife and motor vehicles). The conversion of ecological resources due to construction of the GMPEF would noticeably alter the composition of habitats within the GMPEF Site but would not destabilize the existence of these communities off site; therefore, direct and indirect impacts to existing vegetation, wildlife, and wetlands on site would be MODERATE.	No Additional Impact – Ecological conditions would remain unchanged.
Air Quality	SMALL Air pollutant emissions from equipment used for construction and fugitive emissions from earth disturbing activities would have a temporary impact on the existing ambient air quality in the vicinity of the GMPEF Site. Construction emissions impacts decrease rapidly with distance from a construction site and would not result in long-term impacts. Air emissions from trucks and worker vehicles traveling to and from the GMPEF Site would produce more dispersed and intermittent air quality impacts along local and regional roadways that link to the project site. Emissions from the GMPEF would not measurably change the existing ambient air quality in the vicinity of the GMPEF. Air emissions from mobile combustion equipment and vehicles during decommissioning are expected	No Additional Impact – New air emission sources would not be added to the GMPEF Site. Existing conditions would remain unchanged.

Table 2-1: Comparison of the Impacts from the Proposed Action and the No Action Alternative

Environmental Category	Proposed Action	No Action Alternative
	to be similar to those estimated for construction. Therefore, air quality impacts resulting from the Proposed Action are anticipated to be SMALL.	
Noise and Vibration	SMALL The closest offsite sensitive sound receptor to GMPEF would be residences located approximately 4,300 feet south of the GMPEF Site along Woodville Road. Noise generated on site during construction would be consistent with existing measured ambient sound levels at offsite locations. Noise generated from operations would be below the NRC noise level threshold sound level and vibrations would be imperceptible at the closest sensitive location. Decommissioning of the GMPEF would produce sound levels similar to or lower than construction activities. Therefore, noise impacts resulting from the Proposed Action are anticipated to be SMALL.	No Additional Impact – Existing sound levels would remain unchanged.
Historical and Cultural Resources	SMALL There are no historic or cultural resources within the area of potential effects that are listed in or eligible for the NRHP. Therefore, no adverse effect to historic or cultural properties is anticipated from operation of the facility. Also, no indirect effects would be anticipated from project implementation. Therefore, historical and cultural resources impacts resulting from the Proposed Action are anticipated to be SMALL.	No Additional Impact – Existing conditions would remain unchanged.
Visual/Scenic Resources	SMALL to MODERATE Temporary visual intrusions into the landscape would result from the use of 300-foot tall construction cranes at the GMPEF Site for erecting building structures and installing equipment during the construction period (which is expected to take 2 years, but could last longer). Therefore, the visual/scenic resource impacts resulting from construction for the GMPEF would be MODERATE but temporary to offsite receptors. The GMPEF would be compatible with the BLM VRMS Management Class IV designation. The visual/scenic resource impacts of GMPEF operations at viewpoints outside of the GMPEF Site would be mitigated by the design of 72-foot tall buildings and other GMPEF structures, their distance from public viewpoints, and screening by vegetation. Therefore, visual/scenic resource impacts resulting from operation of the GMPEF are anticipated to be SMALL.	No Additional Impact – Visual/scenic resources impacts would remain unchanged.

Table 2-1: Comparison of the Impacts from the Proposed Action and the No Action Alternative

Environmental Category	Proposed Action	No Action Alternative
Socioeconomic Environment	SMALL Construction of the GMPEF would generate a limited number of new, short-term construction jobs. The projected influx of workers and families is not predicted to strain the housing stock, local school system, or health care system. Operation of the GMPEF would generate a limited number of new jobs. The relatively small number of workers and their families that would be present during GMPEF operations would not strain the housing stock, education, health care, or law enforcement systems. Decommissioning would result in similar overall social and economic impact as construction. Therefore, negative socioeconomic impacts resulting from the Proposed Action are anticipated to be SMALL.	No Additional Impact – Existing population and employment baseline conditions at the GMPEF Site would not be impacted. Existing conditions would remain unchanged.
Public and Occupational Health	SMALL Nonradiological impacts to public and occupational health are anticipated to be SMALL since GMPEF operations would be managed through adherence to the air permit received from KDAQ (which is protective of human health and accounts for all area sources). The impacts associated with potential radiological exposures from the Proposed Action are anticipated to be SMALL for both workers and the public. Through the combination of plant design, passive and active engineered controls (Items Relied on for Safety), and administrative controls, accidents would pose an acceptably low risk to workers, the environment, and the public. Therefore, overall public and occupational health impacts resulting from the Proposed Action are anticipated to be SMALL.	No Additional Impact – Existing conditions would remain unchanged.
Waste Management	SMALL to MODERATE Most solid waste and wastewater management impacts from construction, operation, and D&D of the Proposed Action would be SMALL. Assuming stormwater generation is proportional to the size of the area drained, the stormwater that originates from the 107-acre GMPEF Site would be approximately 17% of the stormwater from the 615-acre industrial portion of the DOE Paducah Site. Therefore, stormwater from the GMPEF Site would have SMALL to MODERATE impact on the DOE stormwater management system. The projected maximum amount of new DUF_6 generated by the GMPEF over a 40-year operating period is 379,000 metric tons (approximately 30,600 cylinders). This could have a MODERATE impact on DUF_6 conversion facilities and LLRW disposal facilities.	No Additional Impact – The No Action Alternative would not generate any wastes. Existing conditions would remain unchanged.

Table 2-1: Comparison of the Impacts from the Proposed Action and the No Action Alternative

Environmental Category	Proposed Action	No Action Alternative

Key: > = greater than; % = percent; BLM VRMS = Bureau of Land Management Visual Resources Management System; D&D = decontamination and decommissioning; DOE = United States Department of Energy; DUF_6 = depleted uranium hexafluoride; EPA = Environmental Protection Agency; GMPEF = General Matter Paducah Enrichment Facility; KDAQ = Kentucky Division for Air Quality; KPDES = Kentucky Pollutant Discharge Elimination System; LLRW = low-level radioactive waste; NRC = United States Nuclear Regulatory Commission; NRHP = National Register of Historic Places; UF_6 = uranium hexafluoride

Table 2-2: Comparison of Potential Impacts to Domestic Capacity and Supply for the Proposed Action and the No Action Alternative

Topic	Proposed Action	No Action Alternative
Domestic Capacity	The initial target production as a result of the Proposed Action would be several million SWU of a combination of LEU and HALEU hexafluoride and could help meet the projected shortfall in U.S. domestic capacity.	Without the additional capacity of the GMPEF, the anticipated demand for additional enrichment capacity may not be met, and the United States may remain largely dependent on foreign suppliers of enrichment services.
Domestic Supply	The Proposed Action would help meet the need for enriched uranium to fulfill commercial nuclear electrical generation requirements.	Under the No Action Alternative, future nuclear electrical generation requirements would not be met.
	The Proposed Action would help meet the need for U.S. domestic uranium enrichment supply for national energy security.	Under the No Action Alternative, important national energy security policy objectives would not be furthered by construction and operation of additional enrichment supply.

Key: GMPEF = General Matter Paducah Enrichment Facility; HALEU = high-assay low-enriched uranium; LEU = low-enriched uranium; SWU = Separative Work Unit; U.S. = United States

Table 2-3: Potential Cumulative Effects

Environmental Category	Potential Cumulative Effects
Land Use	• Existing and other planned land uses for the areas around the GMPEF Site, in combination with the land use impacts resulting from the Proposed Action, would be expected to result in MODERATE cumulative impacts to land cover. • Land use development at the GMPEF Site and the areas around the site are expected to be consistent with current McCracken County zoning regulations and land use plans. Therefore, zoning of the GMPEF Site and surrounding areas would remain heavy industrial and would have SMALL cumulative land use impacts.
Transportation	• The impact of the cumulative daily vehicle trips that would be generated by the GMPEF combined with vehicle traffic from the DOE Paducah Site and the planned PLEF on traffic flow for the segment of Hobbs Road between Woodville Road and the intersection with U.S. Hwy 60 is anticipated to be MODERATE. • On a regional basis, the cumulative transportation impacts for the GMPEF are expected to be SMALL. • Radiological exposure (doses) to the public and workers from radioactive material shipments associated with the Proposed Action would result in SMALL impacts that would not substantially contribute to cumulative impacts of radioactive material transportation in the United States.
Geology and Soils	• Because none of the projects in the area are likely to involve substantial disturbance of deep geologic media; substantial injection of fluids into geologic strata; the sites are not in an area of karst development; and there are no known substantial economic geologic resources (e.g., minerals, aggregate, fossil fuels) beneath the sites; cumulative impacts on geologic resources are expected to be SMALL. • Considering the combined impacts of the three major projects in the area, MODERATE cumulative impacts on soils in the area could result because of removal and covering of soils, compaction, and erosion.
Water Resources	• Groundwater quality impacts are anticipated to be SMALL individually for the construction, operation, and D&D of the Proposed Action. Therefore, it is anticipated that the GMPEF would not substantially contribute to cumulative groundwater impacts. • Sanitary wastewater would be conveyed to the existing DOE management systems and discharged to approved KPDES outfalls. Stormwater would be discharged under a new KPDES permit, with outfalls discharging to Bayou Creek, and/or to Little Bayou Creek. Although cumulative surface water impacts to Little Bayou Creek and Bayou Creek may be MODERATE, the contribution to these impacts from the GMPEF would be SMALL. Likewise, any contribution by the GMPEF to cumulative impacts on the Ohio River, would be SMALL. • Cumulative impacts on floodplains are estimated to be SMALL, and the GMPEF would not be expected to substantially contribute to these impacts. Because of the very large flow of the Ohio River, cumulative impacts on the floodplain of the Ohio River from activities in the area around and including the GMPEF would be SMALL.

Table 2-3: Potential Cumulative Effects

Environmental Category	Potential Cumulative Effects
	• No water resources would be withdrawn onsite from either surface or groundwater for construction, operation, or decommissioning of the Proposed Action. The impacts on water use by the Proposed Action are expected to be SMALL and a small percentage of the water the Paducah Site is permitted to withdraw from the Ohio River or the water supplied by Paducah Water Works. Therefore, water use related to the Proposed Action would not substantially contribute to cumulative water use impacts.
Ecological Resources	• Development of the GMPEF in combination with the projects planned for the foreseeable future on and surrounding the GMPEF Project Area, could result in LARGE impacts to vegetation, MODERATE impacts to wildlife, SMALL impacts to special status species, and SMALL impacts to wetlands.
Meteorology, Climatology, and Air Quality	• Currently, McCracken County attains all NAAQS. Due to its remoteness, emissions emanating from the GMPEF during construction, operation, and decommissioning are not expected to substantially combine with emissions from other sources within the ROI. Therefore, the Proposed Action would contribute to SMALL cumulative air quality impacts. • Implementation of the Proposed Action would produce GHG emissions from fossil-fuel powered (combustive) sources. Project sources would adhere to applicable regulatory requirements, which include measures to minimize fuel consumption and resulting GHG emissions. Therefore, the Proposed Action would not substantially contribute to overall regional and global GHG levels.
Noise	• There could be a cumulative effect of combining the existing ambient noise and the noise from the PLEF and GMPEF activities since these activities may overlap in time. These cumulative impacts could be noticeable on Dyke Road since it is located between the PLEF and GMPEF Sites. Because Dyke Road is not open to the public, impacts on the community would not occur. Due to the distance from the GMPEF Site boundary to the nearest residential receptors to the south, and the nature of sounds emitted during construction, operation, and D&D, the additional noise from the GMPEF is not anticipated to substantially add to the cumulative noise impacts to the community.
Historical and Cultural Resources	• The Proposed Action would not impact cultural resources as no historic properties or other cultural resources are present. Construction, operation, and D&D of the GMPEF would not add to cumulative impacts due to a lack of affected properties.
Visual/Scenic Resources	• The cumulative visual/scenic resources impact of the GMPEF with other planned projects (including the PLEF and turnover of areas to the east of the GMPEF Site for industrial use) would represent a significant change in the overall visual character and value of the landscape in the vicinity of the GMPEF Site. Therefore, it is expected that the cumulative visual/scenic resource impacts resulting from the GMPEF and other projects in the area would be MODERATE. • Because of the location of the GMPEF at some distance from nearby residents, the GMPEF would not substantially contribute to cumulative impacts except during the construction and D&D periods when 300-foot cranes may be used.

Table 2-3: Potential Cumulative Effects

Environmental Category	Potential Cumulative Effects
Socioeconomic Environment	• In migration of new employees and their families to the region would increase the local population by no more than approximately 0.25% with resulting SMALL socioeconomic impacts. Therefore, the GMPEF would not substantially contribute to cumulative socioeconomic impacts. • Operation of the GMPEF would generate approximately $2.8 billion in economic benefit over the 40-year operations period. Averaging approximately $71 million per year, this represents 0.5% of Kentucky's FY 2024 General Fund.
Public and Occupational Health	• Nonradiological impacts to public and occupational health are anticipated to be SMALL since GMPEF operations would be managed through adherence to the air permit received from KDAQ (which is protective of human health and accounts for all sources). • The impacts associated with potential radiological exposures from the Proposed Action are anticipated to be SMALL for both workers and the public. • Through the combination of plant design, passive and active engineered controls (Items Relied on for Safety), and administrative controls, accidents would pose an acceptably low risk to workers, the environment, and the public. • Therefore, the GMPEF would not substantially contribute to cumulative public and occupational health impacts.
Waste Management	• Most solid waste and wastewater management impacts from construction, operation, and D&D of the Proposed Action would be SMALL and would not substantially contribute to cumulative waste management impacts. • Assuming stormwater generation is proportional to the size of the area drained, the stormwater that originates from the 107-acre GMPEF Site would be approximately 16 percent of the stormwater from the 615-acre industrial portion of the DOE Paducah Site. Therefore, stormwater from the GMPEF Site would have SMALL to MODERATE impacts on the DOE stormwater management system. The GMPEF would not substantially contribute to cumulative stormwater impacts in the region. • The projected maximum amount of new DUF_6 generated by the GMPEF over the 40-year operating period is 379,000 metric tons (approximately 30,600 cylinders). This could have a MODERATE impact on DUF_6 conversion facilities and LLRW disposal facilities.

Key: $ = United States dollar; % = percent; APE = Area of Potential Effects; D&D = decontamination and decommissioning; DOE = United States Department of Energy; DUF_6 = depleted uranium hexafluoride; FY = Fiscal Year; GHG = greenhouse gas; GMPEF = General Matter Paducah Enrichment Facility; KDAQ = Kentucky Division for Air Quality; KPDES = Kentucky Pollutant Discharge Elimination System; LLRW = low-level radioactive waste; NAAQS = National Ambient Air Quality Standards; PGDP = Paducah Gaseous Diffusion Plant; PLEF = Paducah Laser Enrichment Facility; ROI = region of influence; U.S. Hwy = United States Highway

3.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT

This section describes the areas that could be affected by the proposed action evaluated in this General Matter Paducah Enrichment Facility (GMPEF) Environmental Report (ER). These descriptions of the affected environment provide context for understanding the potential estimated environmental consequences described in Chapter 4.0, *Environmental Impacts*, and serve as baselines from which any potential estimated environmental consequences can be evaluated.

Identifying or defining the region of influence (ROI) for each resource area is an important component in analyzing environmental consequences. ROIs are specific to the resource area evaluated and encompass geographic areas within which potential impacts could be expected to occur. The ROIs may be as limited as the GMPEF Site, or extend to offsite adjacent areas, or to the communities surrounding the site.

The Nuclear Regulatory Commission Report (NUREG)-1748, *Environmental Review Guidance for Licensing Actions Associated with NMSS Programs* (NRC, 2003), Chapter 6, *The Environmental Report: Format and Technical Content*, states: "It may not be necessary for every resource to receive the same level of detailed review and every action may not require all the information discussed in this chapter. Likewise, the proposed action may present unique issues and require additional information not identified in this chapter. This is consistent with one of the goals of the National Environmental Policy Act, which is to concentrate on issues significant to the proposed action and their potential environmental consequences." In addition, 10 *Code of Federal Regulations* (CFR) 51.45(b)(1) states: "Impacts shall be discussed in proportion to their significance," and Regulatory Guide 4.9, *Preparation of Environmental Reports for Commercial Uranium Enrichment Facilities* (NRC, 1975), states that ER "descriptive and narrative passages should be brief and concise."

In the United States (U.S.) Nuclear Regulatory Commission's (NRC's) Generic Environmental Impact Statements (GEISs), most of the environmental issues evaluated were determined to be Category 1 issues likely to have SMALL impacts. For example, in NRC's most recent GEIS, the *Draft Generic Environmental Impact Statement for Licensing of New Nuclear Reactors* (NUREG-2249) (NRC, 2024a), of the 122 issues evaluated, 100 were determined to be Category 1 issues (environmental issues for which a generic analysis concluding SMALL adverse environmental impacts is possible, provided that relevant values and assumptions in the Plant Parameter Envelope and Site Parameter Envelope are met), 20 were Category 2 Issues [environmental issues for which a meaningful generic analysis of environmental impacts is not possible because the issue requires consideration of project-specific information], and 2 were Uncertain Issues. Although an enrichment facility is different from the nuclear reactors, spent fuel storage facilities, and in-situ leach mining facilities evaluated in the NRC GEISs (NRC, 2002; NRC, 2009; NRC, 2013b; NRC, 2014a; NRC, 2024a), the attributes that typically produce environmental impact (e.g., land area disturbed, depth of excavation, height of buildings, noise produced, water used, workers employed, and effluents released) would be expected to be similar or less.

In addition, most of the impacts of construction and operation of the GMPEF would be similar to constructing and operating a typical commercial or industrial building complex. Only the impacts related to handling and management of radioactive and hazardous materials would be unique. This provides further support for the reduced level of detail and more focused approach in this GMPEF ER.

The Paducah Site has been used for uranium enrichment activities for over 60 years (1952 to 2013) and is well characterized. In addition, the U.S. Department of Energy (DOE) has an extensive monitoring network and reports the results of the monitoring in annual environmental reports, the latest of which was prepared in 2024 (DOE, 2024b). Also, an ER and Environmental Impact Statement (EIS) were recently prepared by GLE and NRC, respectively, for a Laser Enrichment Facility proposed to be located at a site

directly adjacent to the proposed GMPEF Site (GLE, 2025; NRC, 2026). Similarly, an Environmental Assessment (EA) was issued by DOE for site preparation activities; state licensing; and the construction, operation, and eventual decommissioning of radiological and nonradiological auxiliary facilities at the GMPEF Site.

In keeping with Congressional direction and the current administration's push for efficiency and streamlined environmental documents, the applicant is incorporating substantial portions of the Paducah Laser Enrichment Facility (PLEF) ER (GLE, 2025) and EIS (NRC, 2026) by summarization and reference and has described in Table 3-1, why a reduced level of detail and more focused approach in the GMPEF ER is warranted. The PLEF is an appropriate reference due to its direct geographic adjacency and shared physical boundary of the Paducah Gaseous Diffusion Plant (PGDP). Therefore, they share the same regional geology, hydrogeology, surface water drainage patterns, and ecological setting as well as shared demographic and socioeconomic settings, and some regulatory responsibilities. The GMPEF and PLEF also share a site legacy and historical land-use context. [redacted] (Trade Secret / Confidential Commercial Information) the PLEF is an appropriate reference for the GMPEF's site and regional environmental conditions, [redacted] (Trade Secret / Confidential Commercial Information)

Table 3-1: Level of Detail for the Affected Environment Information

Resource Area	Level of Detail Provided
Land Use	The parcels of land to be used for the GMPEF are currently zoned heavy industrial. The zoning for the site would not change. Therefore, consistent with the small potential for environmental impacts, a reduced level of detail and more focused approach for land use is provided in this section [a].
Transportation	Shipments of materials during construction would be typical of those needed for construction of an industrial facility. Shipment of materials during operation would be similar to an industrial facility except for the shipment of uranium source materials and the enriched uranium product. The transport of radioactive material will be done in compliance with existing NRC and DOT regulations. Construction and operations activities would employ approximately 600 and 140 employees, respectively. Therefore, consistent with the small potential for environmental impacts, a reduced level of detail and more focused approach for transportation is provided in this section that concentrates on the shipment of uranium source materials and the enriched uranium product.
Geology and Soils	The Proposed Action would involve normal excavation activities up to a maximum of 10 feet below the ground surface for the replacement of unsuitable soil, with no deep foundations or injection of fluids at depth. Therefore, consistent with the shallow nature of proposed ground disturbance and the small potential for environmental impacts to geology, a reduced level of detail and more focused approach for geology and soils is provided in this section [b].
Water Resources	The GMPEF will obtain water from the DOE Paducah Site system [c]. Therefore, no surface or groundwater at the site would be used as a water supply. The GMPEF will discharge sanitary wastewater to the DOE Paducah Site sanitary system and stormwater will be conveyed to newly permitted outfalls. No untreated effluent would be discharged to surface water or groundwater. Therefore, consistent with the small potential for environmental impacts, a reduced level of detail and more focused approach for water resources is provided in this section.

Table 3-1: Level of Detail for the Affected Environment Information

Resource Area	Level of Detail Provided
Ecological Resources	Affected environment for vegetation, fish and wildlife, special status species, and wetlands for the proposed GMPEF is well described and similar in comparison (site is directly adjacent) to the areas evaluated in Section 3.5 of the PLEF ER (GLE, 2025). GMPEF ER Section 3.5 provides updates to these descriptions, including site-specific information collected via targeted field surveys.
Meteorology, Climatology, and Air Quality	The meteorology, climatology, and air quality affected environment for the proposed GMPEF is well described and essentially identical to the one presented in Section 3.6 of the PLEF ER. GMPEF ER Section 3.6 provides updates to these descriptions, including the air quality regulatory setting. Currently, the EPA designates McCracken County (the air quality ROI) as an attainment area for all national ambient air quality standards. Therefore, consistent with the small potential for environmental impacts, a reduced level of detail and more focused approach for meteorology, climatology, and air quality is provided in this section.
Noise	The GMPEF Site is 4,300 feet from the nearest residence. Noise during construction and operation of the GMPEF would be typical of an industrial facility. Construction activities would occur over a period of 2 years. Therefore, consistent with the small potential for environmental impacts, a reduced level of detail and more focused approach for noise is provided in this section.
Historical and Cultural Resources	Affected environment for cultural resources for the proposed GMPEF is well described in Section 3.8 of the GLE Laser Enrichment Facility ER (GLE, 2025) and Section 3 of the Phase I Archaeological Reconnaissance for Leasing Parcel A, McCracken County, Kentucky (Martin, 2025a). Evaluation of NRHP resources and recommendations for a determination of no historic properties affected are supported in these documents. Therefore, consistent with the small potential for environmental impacts, a reduced level of detail and more focused approach for historical and cultural resources is provided in this section.
Visual/Scenic Resources	Construction and operations activities would be typical of an industrial facility. Construction activities are likely to have the most visual impact due to the 300 foot tall cranes that would be used. Construction would occur over a period of 2 years. During operations, the tallest structures would be the air emissions stacks at approximately 72 feet. The buildings would be approximately 71 feet tall. The GMPEF Site is 4,300 feet from the nearest residence and views of the GMPEF during operations would be screened by vegetation and other buildings. Therefore, consistent with the small potential for environmental impacts, a reduced level of detail and more focused approach for visual and scenic resources is provided in this section.
Socioeconomic Environment	Construction and operations activities would employ 600 and 140 employees, respectively. Construction and operations activities would be typical of an industrial facility except for installation of the enrichment equipment and operations related to handling the uranium and DU. Therefore, most of the construction and operations workforce is expected to come from the local population. The 600 workers employed during construction and the 140 workers employed during operations of the GMPEF would be a small portion (0.4% to 1.8%) of the 34,522 workers in Ballard and McCracken Counties. The infusion of additional dollars into the local economy would have a largely beneficial impact. Therefore, consistent with the small potential for adverse environmental impacts, a reduced level of detail and more focused approach for socioeconomics is provided in this section.

Table 3-1: Level of Detail for the Affected Environment Information

Resource Area	Level of Detail Provided
Public and Occupational Health	The proposed GMPEF is on a portion of the DOE Paducah Site and thus the affected environment for Public and Occupational Health is well characterized through extensive sampling and documentation in ASERs and the data supplied in the Leasing Data Package (DOE, 2025a). These studies have convincingly demonstrated that the radiation and chemical risks to visitors and the public from existing activities at the proposed GMPEF Site will be very small from all potential exposure methods except from exposure to direct radiation from the UF_6 storage cylinders at the north end of the proposed site and from adjacent storage facilities on the Paducah Site. Radiation monitoring data from four detectors near the sides of existing cylinder storage yard indicate that an annual dose of about 1 rem would be possible if one were at those monitoring points continuously for a year. All other potential exposure pathways are very small in comparison. Thus, radiation control practices for the GMPEF will have to consider direct radiation from these cylinders in ensuring that the workers and public are adequately protected.
Waste Management	GeM has no existing facilities at this site and is not currently generating any waste. Therefore, consistent with the small potential for adverse environmental impacts, a reduced level of detail and more focused approach for waste management is provided in this section.

Key: % = percent; ASER = Annual Site Environmental Report; DOE = United States Department of Energy; DOT = United States Department of Transportation; DU = depleted uranium; EPA = Environmental Protection Agency; ER = Environmental Report; GeM = General Matter, Inc.; GMPEF = General Matter Paducah Enrichment Facility; NRC = United States Nuclear Regulatory Commission; NRHP = National Register of Historic Places; PGDP = Paducah Gaseous Diffusion Plant; PLEF = Paducah Laser Enrichment Facility; rem = roentgen equivalent man; ROI = region of influence; UF_6 = uranium hexafluoride

Notes:

[a] The affected environment information used to describe the impacts of clearing the remaining 6.8 acres of currently undeveloped forested land (needed to construct the GMPEF switchyard in Parcel C) is presented in the appropriate sections of the ER, including *Geology and Soils, Water Resources*, and *Ecological Resources*.

[b] Geologic information required to understand groundwater issues is presented primarily in Section 3.4.1, *Groundwater*. Geology and soils information required to understand site safety and accidents is presented primarily in the safety analysis documents.

[c] In the future, water may be supplied by Paducah Water.

3.1 Land Use

The GMPEF Site (also referred to as the GMPEF Project Area) is located in Western Kentucky, in the northwestern portion of rural McCracken County. It is approximately 10 miles west of Paducah. It should be noted that the GMPEF Site is located on Federal land owned by DOE and leased to General Matter, Inc. (GeM).

3.1.1 Regional Setting

A 10-mile radius around the GMPEF Site mostly incorporates McCracken, Ballard, and Massac Counties, with Livingston County partially included. There is greater emphasis on describing the characteristics of McCracken County and adjacent Massac County due to the location of the GMPEF Site in McCracken County. Figure 3-1 and Table 3-2 provide insight into land cover by acreage of the GMPEF Site. Descriptions of the transportation corridors are presented in Section 3.2, *Transportation*.

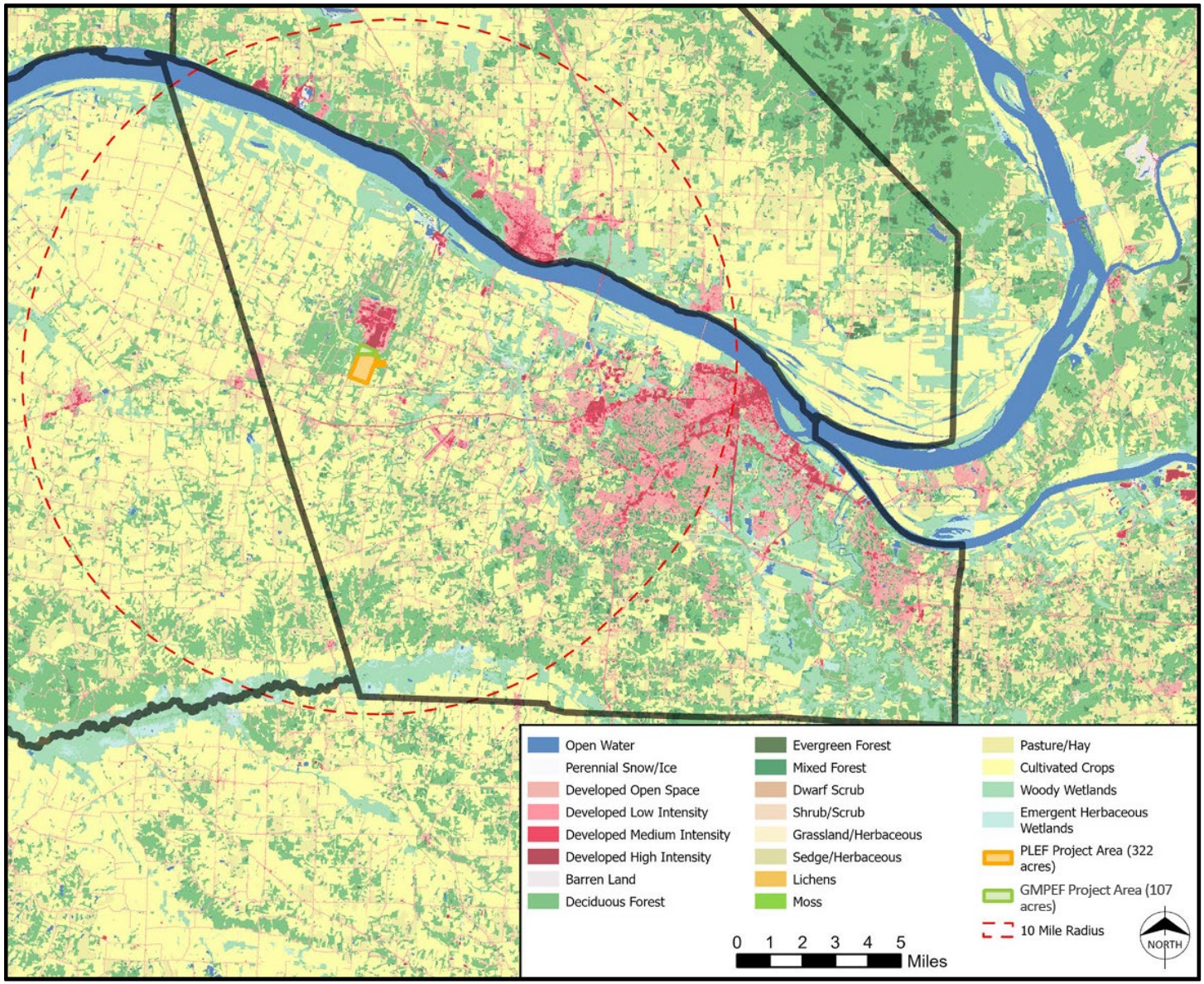


Figure 3-1: Land Classifications within 10 Miles of the PLEF and GMPEF Sites (adapted from GLE, 2025)

Table 3-2: Land Cover by Acreage in 10-Mile Radius of the PLEF and GMPEF Sites

USGS Land Cover Class	Total Land Cover (acres)
Cultivated Crops	13,095
Deciduous Forest	6,632
Pasture/Hay	5,379
Woody Wetlands	2,390
Developed Open Space	2,162
Open Water	1,382
Developed Low Intensity	859
Mixed Forest	691
Developed Medium Intensity	331
Emergent Wetlands	319
Developed High Intensity	160
Evergreen	39
Grassland	34
Barren Land	26
Shrub	12

Sources: (GLE, 2025; USGS, 2024a)
Key: GMPEF = General Matter Paducah Enrichment Facility; PLEF = Paducah Laser Enrichment Facility; USGS = United States Geological Survey

3.1.1.1 *McCracken County*

As described in the PLEF ER (GLE, 2025) McCracken County is situated in the far western portion of Kentucky. The county seat and only municipality is Paducah. McCracken County covers a total area of 268 square miles. Of this, 19 square miles (approximately 7.2 percent) consists of water. The Ohio River forms the county's northern border with Illinois, while the Tennessee River defines its northeastern border (NRC, 2026).

3.1.1.2 *Ballard County*

Ballard County is a rural community situated in the western portion of Kentucky. The county seat is Wickliffe. Ballard County comprises a total area of 254 square miles. The Ohio River forms the county's northern and western border with Illinois. Carlisle and McCracken Counties share the southern and eastern boundaries (NRC, 2026).

3.1.1.3 *Massac County*

Massac County is a community in Illinois situated at the border with Kentucky. The county seat is Metropolis. Massac County comprises a total area of 242 square miles. Of this, 4.6 square miles (approximately 1.9 percent) are water (NRC, 2026).

3.1.2 Land Use Plans

In February 2023, the McCracken County and Paducah governments approved a 20-year interlocal cooperation agreement, which establishes a joint City/County Comprehensive Plan (GLE, 2025; City of Paducah, 2025a). The joint City/County Comprehensive Plan was drafted in mid-2024 and adopted January 28, 2025 (Paducah Board of Commissioners, 2025). Core themes focus on tourism, economic diversity and sustainability, and neighborhood revitalization. The current countywide land classification map (Figure 3-1) indicates the locations of specific land category designations within McCracken and Paducah. The land categories are Vacant, Single Family Residential, Multifamily Residential, Commercial and Services, Industrial and Transportation, Communications and Utilities, Public and Quasi-Public, Parks and Recreation, Agriculture, and Rural (GLE, 2025). Figure 3-2 shows the future land use classifications in McCracken County. The applicability of the land classification map categories to the GMPEF Site is discussed in Section 3.1.5, *Agricultural Products*. Since project facilities are not proposed for the other counties, land use plans for these counties are not discussed.

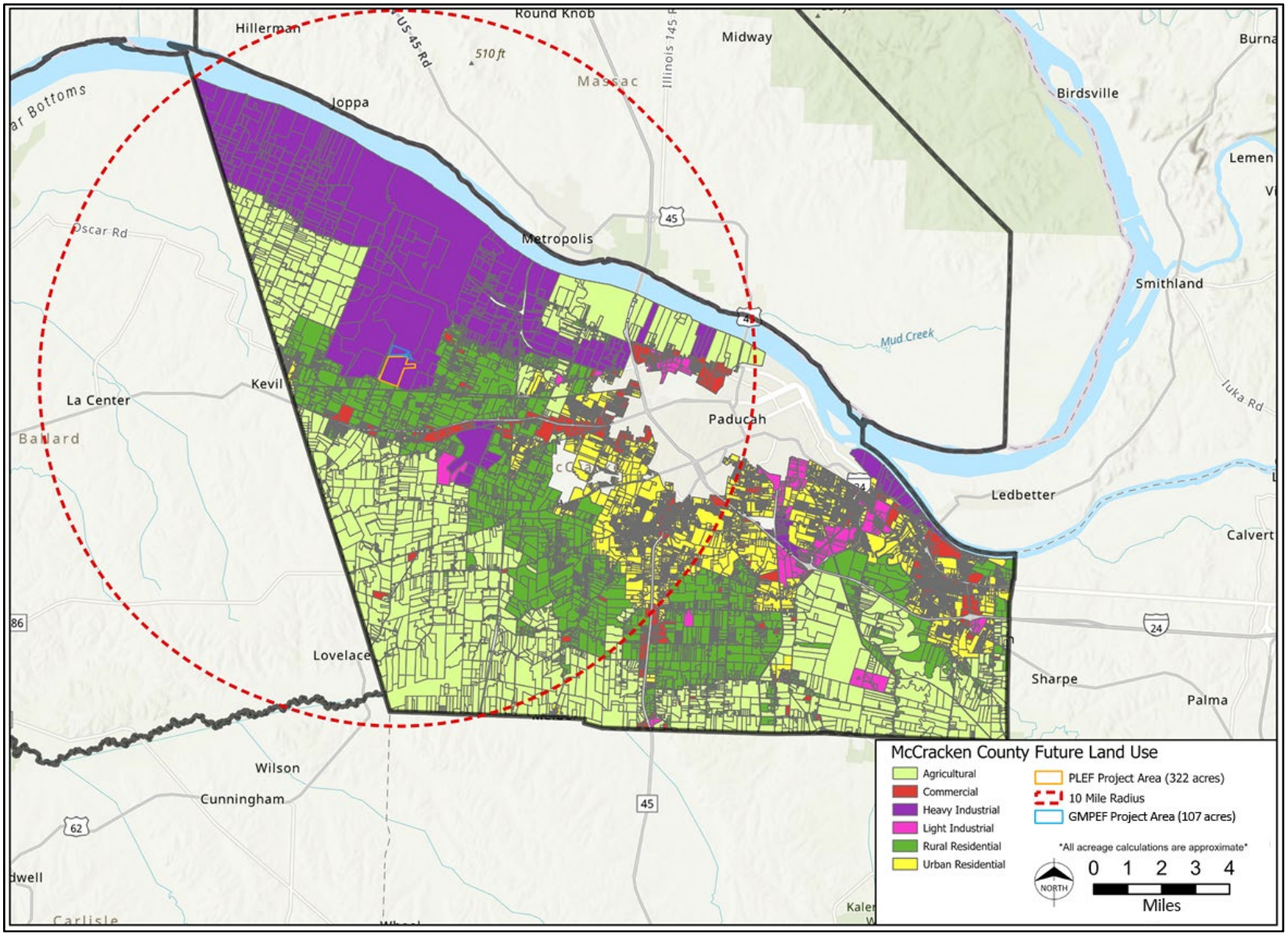


Figure 3-2: Future Land Use for McCracken County (adapted from GLE 2025)

3.1.3 Special Land Use Classifications

There are no special land use classifications within the three-county region for American Indian reservations (GLE, 2025). Similarly, there are no national parks, federally designated wilderness areas, military installations, or federally designated wild and scenic rivers present within the three-county region (GLE, 2025; National Wild and Scenic Rivers, 2025). There are several State parks, a national battlefield, various national historical landmarks, and other special land use classifications (GLE, 2025). Environmentally Sensitive Areas are discussed in Section 3.5, *Ecological Resources*.

3.1.3.1 *Environmental Conservation Areas*

As described in the PLEF EIS (NRC, 2026), there are no federally designated National Conservation Lands in the three-county region; however, the GMPEF Site is adjacent to lands previously utilized by the West Kentucky Wildlife Management Area (WKWMA). Following recent land transfers, future use of the area would include industrial land uses. Lands previously utilized by the WKWMA and the Ballard Wildlife Management Area are within a 10-mile radius of the GMPEF Site (GLE, 2025).

3.1.3.2 *Prime and Unique Farmland*

The Farmland Protection Policy Act (7 United States Code [U.S.C.] 4201(c)(1)(A)) defines prime farmland as "land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion, as determined by the Secretary [of Agriculture]. Prime farmland includes land that possesses the above characteristics but is being used currently to produce livestock and timber. It does not include land already in or committed to urban development or water storage" (GLE, 2025; USDA, 2024).

Some areas surrounding the GMPEF Site have been designated as prime farmland and farmland of "local importance" pursuant to § 4201(c)(1)(C) by the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (see Section 3.3.4, *Geotechnical Conditions*, for information about soil types at the GMPEF Site). A breakdown of prime farmland data in the region is provided in Table 3-3. Within the approximately 107-acre GMPEF Site, 92.9 acres are considered prime farmland (if drained) or farmland of state importance. Specifically, 13.5 acres are Calloway silt loam and 72.2 acres are Routon silt loam, which are considered prime farmland if drained. Grenada silt loam soil, which is considered farmland of state importance, makes up 7.4 acres of the site. Soil in the remainder of the 107-acre GMPEF Site is classified as Urban-udorthents, which is not prime farmland (USDA NRCS, 2026a; USDA NRCS, 2026b).

Table 3-3: Prime Farmland in the Region

Farm Class	Ballard and McCracken Counties	Massac County
All areas are prime farmland (acres)	64,492	12,591
Farmland of statewide importance (acres)	18,843	14,361
Not prime farmland (acres)	69,769	11,915
Prime farmland if drained (acres)	51,598	14,192
Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season (acres)	11,762	312
Prime farmland if protected from flooding or not frequently flooded during the growing season (acres)	6,095	360
Total (acres)	222,559	53,731

Sources: (GLE, 2025; SSURGO, 2022; NRC, 2026)

3.1.3.3 *McCracken County*

In McCracken County, there are 339 farms comprising over 59,709 acres with an average size of 176 acres. The types of farms consist of cropland (67 percent), pastureland (5 percent), woodland (19 percent), and other (5 percent). Only 68 acres of McCracken County farmland is irrigated (GLE, 2025; USDA, 2022a; NRC, 2026).

3.1.3.4 *Ballard County*

In Ballard County, there are 307 farms comprising over 93,696 acres with an average size of 305 acres. The types of farms consist of cropland (82 percent), pastureland (5 percent), woodland (11 percent), and other (3 percent). The amount of irrigated farmland in Ballard County is withheld to avoid disclosing data for individual operations (GLE, 2025; USDA, 2022b; NRC, 2026).

3.1.3.5 *Massac County*

In Massac County, there are 350 farms comprising over 127,131 acres with an average size of 363 acres. The types of farms consist of cropland (80 percent), pastureland (4 percent), woodland (13 percent), and other (4 percent). Approximately 10,229 acres (8 percent of farmland) of Massac County farmland is irrigated (GLE, 2025; USDA, 2022c; NRC, 2026).

3.1.4 Parks and Recreation Areas

3.1.4.1 *McCracken County*

McCracken County is home to numerous parks and recreational areas. Noble Park is composed of 135 acres and offers a variety of activities such as walking trails, fishing lakes, playgrounds, and picnic areas (GLE, 2025; City of Paducah, 2025b). Stuart Nelson Park is another notable recreational area in the county, composed of approximately 55 acres. The park has baseball and soccer fields as well as a dog park (GLE, 2025).

3.1.4.2 *Ballard County*

Ballard County offers over 30,000 acres of land for outdoor recreational activities, focusing on outdoor sports. Located near the Mississippi and Ohio Rivers, waterfowl hunting is a popular activity offered in the county. The Ballard Wildlife Management Area and Boatwright Wildlife Management Area offer 8,015 and 8,389 acres respectively of public hunting space (GLE, 2025; Ballard County, 2025).

3.1.4.3 *Massac County*

Massac County offers a range of parks and recreational activities focused on nature and outdoor adventures. The county is home to Fort Massac State Park, which has nearly 1,500 acres for picnics, camping, hiking, fishing, boating, and seasonal hunting. Proximity to the Ohio River provides Massac County with numerous opportunities for fishing, boating, and water sports (GLE, 2025; Illinois DNR, 2025).

3.1.5 Agricultural Products

This section discusses agriculture in the three-county region. Agriculture plays a key role in the local economy of this region and its proximity to the Ohio River allows for efficient transportation of agricultural goods. Table 3-4 provides agricultural information for the following counties.

Table 3-4: Agriculture Information by County

Measure	McCracken County	Ballard County	Massac County
Number of Farms	339	307	350
Total Land in Farms (acres)	59,709	93,696	127,131
Average Farm Size (acres)	176	305	363
Harvested Cropland (acres)	39,814	76,698	92,000

Sources: (GLE, 2025; USDA, 2022a; USDA, 2022b; USDA, 2022c)

3.1.5.1 *McCracken County*

Soybean, corn, forage, and wheat are all key crops within McCracken County. There are approximately 21,698 acres of soybeans; 12,068 acres of corn; 5,175 acres of wheat; and 1,941 acres of forage. McCracken County is ranked 33rd statewide in poultry sales and 89th in cattle sales (GLE, 2025; USDA, 2022a).

3.1.5.2 *Ballard County*

Soybean, corn, forage, and wheat are all key crops within Ballard County. There are approximately 25,175 acres of corn; 10,206 acres of wheat; and 2,981 acres of forage. Ballard County is ranked 16th statewide in poultry and egg sales and 84th in cattle sales (GLE, 2025; USDA, 2022b).

3.1.5.3 *Massac County*

Soybean, corn, forage, and wheat are all key crops within Massac County. There are approximately 52,891 acres of soybeans; 29,970 acres of corn; 4,327 acres of forage; and 3,739 acres of wheat. Massac County is ranked 97th statewide in poultry sales and 59th in cattle sales (GLE, 2025; USDA, 2022c).

3.1.6 Zoning of the GMPEF Site and Vicinity

The GMPEF Site is located in McCracken County to the west of the City of Paducah. DOE has dictated that the property will adhere to MH land use restrictions. As defined in McCracken County Zoning Ordinance Section 150.057, an MH designation allows for the principal permitted uses of power production and distribution, along with heavy manufacturing, processing and storage. This includes production, process, storage, and handling of uranium and other radioactive materials and compounds. Additionally, any industrial use is allowed if it is determined that there is no detriment to the properties immediately adjacent. The MH designation also incorporates all the permitted uses with the Light Industry Zone. The surrounding properties are also zoned MH (GLE, 2025).

3.2 Transportation

As described in the PLEF ER (GLE, 2025), McCracken County and Ballard County are served by major transportation modes, including interstate highways, railways, a riverport, and a regional airport. Interstate (I-) 24 (I-24) passes directly through Paducah and intersects I-69 to the east in Calvert City. Paducah also has a riverport and a north-south rail corridor. Scheduled commercial airline service is provided to the region through the Barkley Regional Airport in the western portion of Paducah. The Paducah Area Transit System provides public bus service to residents of Paducah and McCracken County (GLE, 2025).

3.2.1 Regional Transportation Corridors

3.2.1.1 *Roads and Highways*

I-24 is an east-west interstate that passes through Paducah in McCracken County. I-24 spans approximately 320 miles between Pulleys Mill, Illinois, to the west and Chattanooga, Tennessee, to the east, passing through Illinois, Kentucky, Tennessee, and Georgia. To the east of Paducah is the interchange with I-24 and north-south I-69 in Calvert City. This segment of I-69 connects Calvert City, Kentucky, to the north and Fulton, Kentucky, to the south, and is one of 32 separate segments in Texas, Louisiana, Arkansas, Mississippi, Tennessee, Kentucky, Indiana, and Michigan that, when complete, will span approximately 2,680 miles to establish the I-69 corridor. I-69 has been identified by the U.S. Congress as a high priority corridor (FHWA, 2012; NRC, 2026). High priority corridors are designated because of their significance in serving regional, national, and international freight and vehicle movements, and this designation allows for National Corridor Planning and Development Funds to be administered by the U.S. Secretary of Transportation for planning, construction, and maintenance.

3.2.1.2 *McCracken County*

The major transportation features within McCracken County are shown on Figure 3-3. I-24 is the primary highway corridor in McCracken County, linking Paducah to Illinois to the north and to the I-69 interchange to the east (including most of Kentucky's major cities such as Bowling Green, Louisville, and Lexington). Other significant thoroughfares within McCracken County include U.S. Highway (U.S. Hwy) 60, which links Paducah to Wickliffe in Ballard County to the west and to Marion in Crittenden County to the northeast; U.S. Hwy 62, which links Paducah to Bardwell in Carlisle County to the west and to Calvert City in Marshall County to the east; and U.S. Hwy 45, which links Mayfield in Graves County to the south and Southern Illinois to the north (GLE, 2025).

3.2.1.3 *Ballard County*

The primary east-west highways in Ballard County are U.S. Hwy 60 and Kentucky Route 286 (KY-286) (Wickliffe Road), linking Wickliffe to the west and Paducah to the east in McCracken County. U.S. Hwy 51 links Wickliffe to Fulton in Southwest Kentucky and to Northern Tennessee to the south and crosses the Ohio River to the northwest, connecting Southeastern Missouri and Southern Illinois (NRC, 2026).

3.2.1.4 *Future McCracken and Ballard County Improvements*

A major widening project is underway to create a bypass south of the City of Kevil to widen U.S. Hwy 60 between La Center to the west in Ballard County and the existing four-lane section of U.S. Hwy 60 to the east in McCracken County. Kevil is located in Ballard County on the edge of the McCracken County line. This approximately 6-mile section of U.S. Hwy 60 is currently two lanes and will be widened to four lanes. The purpose of this project is to improve mobility and safety. The existing narrow lanes, limited passing opportunities, substandard curves, and frequent access points through Kevil make the route challenging for larger vehicles. U.S. Hwy 60 provides the only east-west state-designated truck route west of Paducah, connecting to the Ohio River Bridge to the west in Wickliffe (GLE, 2025; KYTC, 2020b).

The Level of Service (LOS) is the most common measure of highway capacity and relative congestion. Roads are evaluated and assigned one of six grades ranging from A to F. An LOS rating of D or better is considered desirable for urban areas, and an LOS rating of C or better is considered desirable for rural areas. The Paducah-McCracken County Transportation Study dated March 2002 provides LOS estimates for heavily traveled streets in Paducah, but the study did not evaluate roads in outlying areas. U.S. Hwy 60 and U.S. Hwy 62 are estimated to operate at LOS rating of C or better within the study limits (GLE, 2025; KYTC, 2002).

3.2.1.5 *Waterways*

GeM does not plan to move any material via water therefore waterways are not discussed further.

3.2.1.6 *Railways*

Freight service to the region is provided by Canadian National Railway. Bulk transfer terminals are located in Paducah and Calvert City. As shown on Figure 3-3 there are two rail corridors in the region provided by the Canadian National Railway between Fulton, Kentucky, to the south and Effingham, Illinois, to the north. One rail line runs through Paducah in McCracken County (with a Burlington Northern Santa Fe, LLC line branching off to the northwest in Metropolis, Illinois). The second rail line runs through Wickliffe in Ballard County; Norfolk Southern and Amtrak also operate on this line (GLE, 2025). These Canadian National Railway lines connect to Burlington Northern Santa Fe, LLC, Paducah & Louisville Railway, and CSX Class 1 rail lines in the region. Access to the Paducah-McCracken County Riverport is provided via a Paducah & Louisville Railway short line.

Amtrak operates the City of New Orleans route between New Orleans, Louisiana, and Chicago, Illinois, with stations along the route in cities including Jackson, Mississippi; Memphis, Tennessee; Fulton, Kentucky;

Carbondale, Illinois; Effingham, Illinois; Champaign, Illinois; and Chicago, Illinois (GLE, 2025; Amtrak, 2025). The closest passenger rail terminal is 39 miles south of the GMPEF Site in Fulton County (GLE, 2025).

3.2.1.7 *Airports*

Within McCracken County, there is one airport (Barkley Regional) and two heliports (Lourdes Hospital and Western Baptist Hospital). Barkley Regional Airport (PAH) is a publicly owned airport located approximately 3 miles (4.83 kilometers) southeast of the GMPEF Site. PAH has two runways and a single terminal with eight gates (GLE, 2025; Rindfleisch, 2023). PAH is also home to one fixed-base operator, which currently houses and serves approximately 40 private aircraft (GLE, 2025; AirNav, 2025; FAA, 2025). As of February 2026, PAH has daily direct flights operated by SkyWest operating as United Express to and from Chicago O'Hare in Chicago, Illinois, and Houston George Bush Intercontinental in Houston, Texas.

3.2.2 Paducah Site Transportation Access

3.2.2.1 *Existing Transportation Routes and Traffic Patterns*

The GMPEF Site is located northeast of the intersection of Kentucky Route 725 (KY-725) (Woodville Road) and KY-1154 (Hobbs Road) and south of the Paducah Site. Existing decommissioning operations at the Paducah Site receive materials and supplies by truck and rail shipments, and products produced at the Paducah Site are shipped off site by truck and rail. Current access to and from the Paducah Site is from U.S. Hwy 60 via KY-1154 (Hobbs Road). U.S. Hwy 60 is a four-lane road from the I-24 interchange approximately 9 miles east of the Paducah Site that narrows to two lanes immediately west of KY-1154 (Hobbs Road). The KYTC designates U.S. Hwy 60 as a rural principal arterial and KY-1154 (Hobbs Road) as a rural minor collector (KYTC, 2025a).

Figure 3-4 shows the most recent KYTC Average Annual Daily Traffic (AADT) counts for highways and roads located in the vicinity of the Paducah Site (KYTC, 2025b). The AADT value represents the total number of vehicles expected to travel along a given segment of road on an average day and is an indicator of traffic volume.

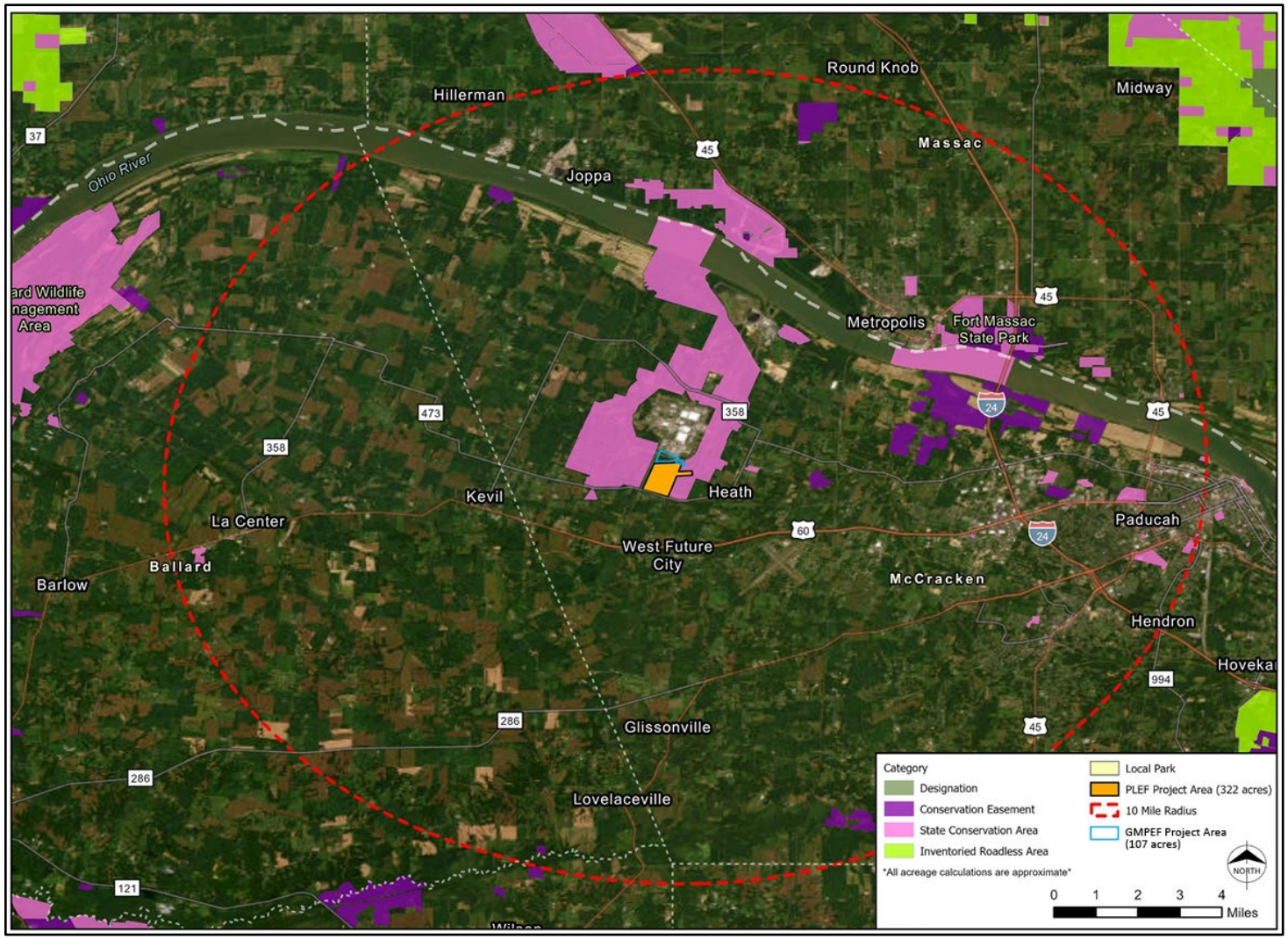


Figure 3-3: Major Transportation Features in McCracken County (adapted from (GLE, 2025))

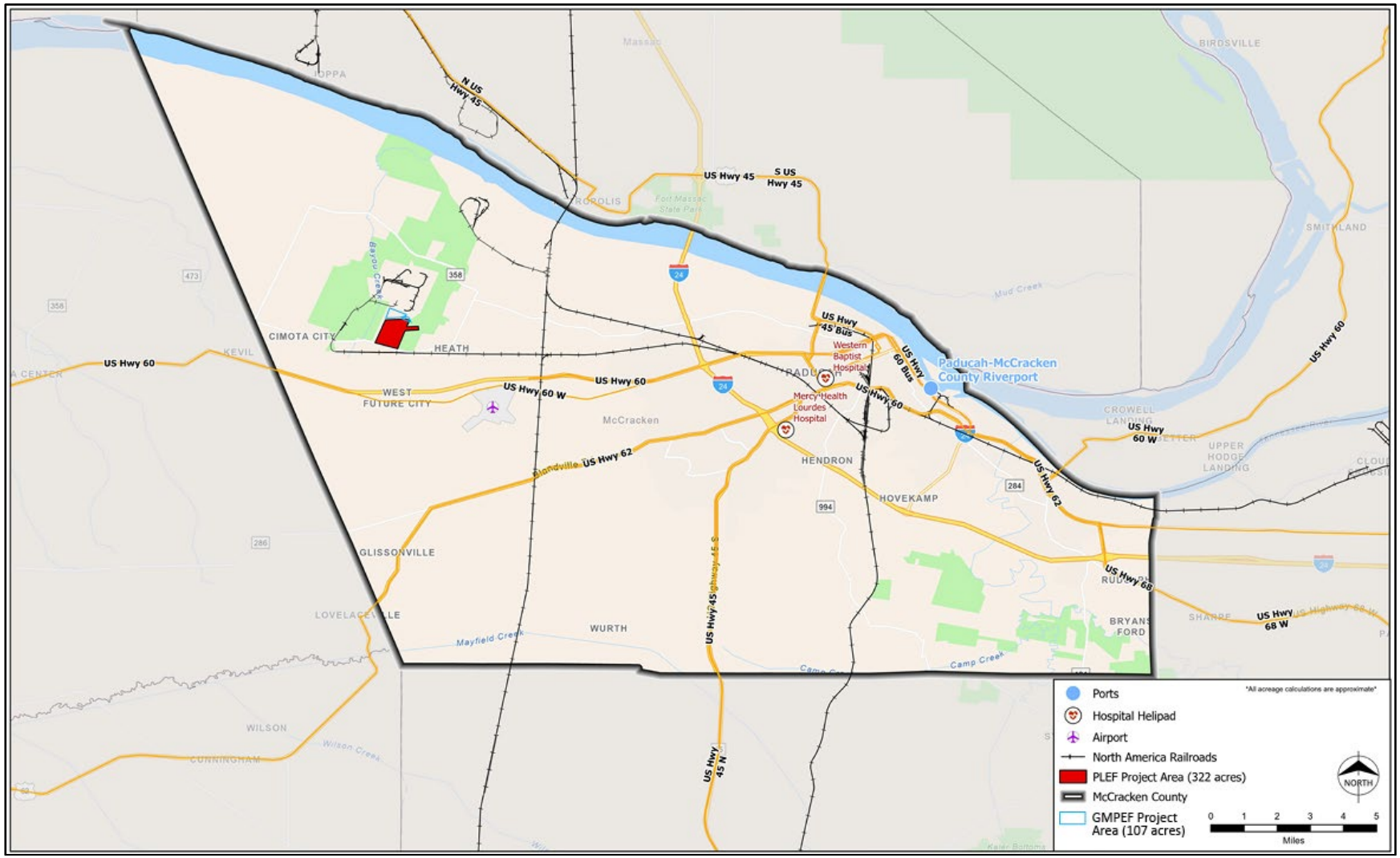


Figure 3-4: KYTC AADT Counts for Roadways Near the GMPEF Site

The most common route currently used for trucks, visitor vehicles, and employee vehicles to the Paducah Site is via U.S. Hwy 60 (eastbound from Ballard County to the west and westbound from McCracken County and I-24 to the east) and exiting to the north onto KY-1154 (Hobbs Road). Vehicles can alternatively access Hobbs Road via KY-725 (Woodville Road). In 2024, the AADT for U.S. Hwy 60 east of the Paducah Site (near Kelly Road and Metropolis Lake Road) was 9,630 vehicles, and the AADT for U.S. Hwy 60 west of the Paducah Site (near Roberts Road and Rice Springs Road) was 7,475 vehicles (2023 data) (see Table 3-5). These traffic volumes are expected to be within capacity for a rural two-lane highway. Approximately 1,300 workers commute to and from the Paducah Site (PPPO TSS, 2024). The daily trips of workers to and from the Paducah Site are already accounted for in the AADT estimates. Also included in these estimates are the existing truck and ancillary traffic associated with the existing operations at the Paducah Site. During construction of the GMPEF, there would be about 600 workers plus 40 truck deliveries. During operation of the GMPEF, there would be about 140 commuting workers, about 3 truck transports per day for general delivery, 15 trucks per week for new cylinders delivery, and 3 trucks per week for product delivery in 30B containers (see Appendix A, *Facility Description*).

Table 3-5: Kentucky Transportation Cabinet AADT Counts for Access Routes to and from the GMPEF Site

Traffic Count Station Location	2025 AADT
GMPEF Site Access to and from I-24	
I-24 west of U.S. Hwy 60 Exit (Exit 4)	29,771 [a]
I-24 east of U.S. Hwy 60 Exit (Exit 4)	44,483 [b]
U.S. Hwy 60 (Hinkleville Rd) between I-24 (Exit 4) and KY-998 (Olivet Church Rd)	28,488 [c]
U.S. Hwy 60 between KY-998 (Olivet Church Rd) and KY-1565 (Mayfield Metropolis Rd)	14,646 [d]
U.S. Hwy 60 between KY-1565 (Mayfield Metropolis Rd) and KY-1154 (Hobbs Rd)	9,630 [d]
GMPEF Site Access to and from Ballard County	
U.S. Hwy 60 west of KY-1154 (Hobbs Rd)	7,475 [d]

Source: (KYTC, 2025b)
Key: AADT = Average Annual Daily Traffic; GMPEF = General Matter Paducah Enrichment Facility; Hwy = Highway; I- = Interstate; KY = Kentucky Route; Rd = Road; U.S. = United States
Notes: A review of the traffic count from Kentucky Transportation Cabinet traffic count map indicates the AADT values that are not significantly different on a year-by-year basis.
[a] Section ID: 073D13
[b] Section ID: 073D71
[c] Section ID: 073A45
[d] This data is from 2023.

Access onto the DOE Paducah Site from U.S. Hwy 60 is through one gate entrance on KY-1154 (Hobbs Road) located north of KY-725 (Woodville Road). Once on the Paducah Site, workers and visitors park their vehicles in one of several designated parking lots. Trucks move to the appropriate loading/unloading areas over a network of service roads between the manufacturing and services operations (GLE, 2025).

3.2.2.2 *Proposed Routes for Transportation Corridors to and from the GMPEF Site*

The existing local roadway routes used for transportation access to and from the existing manufacturing and services operations at the Paducah Site by employees and truck shipments will continue to be used for the GMPEF. Figure 3-5 shows the proposed routes of transportation corridors to and from the GMPEF Site that will predominately be used to transport materials required for construction and operation of the GMPEF. Drivers would likely enter and exit the GMPEF Site via Hobbs Road and use State Route 60 to connect to Interstate 24 east of the GMPEF Site.

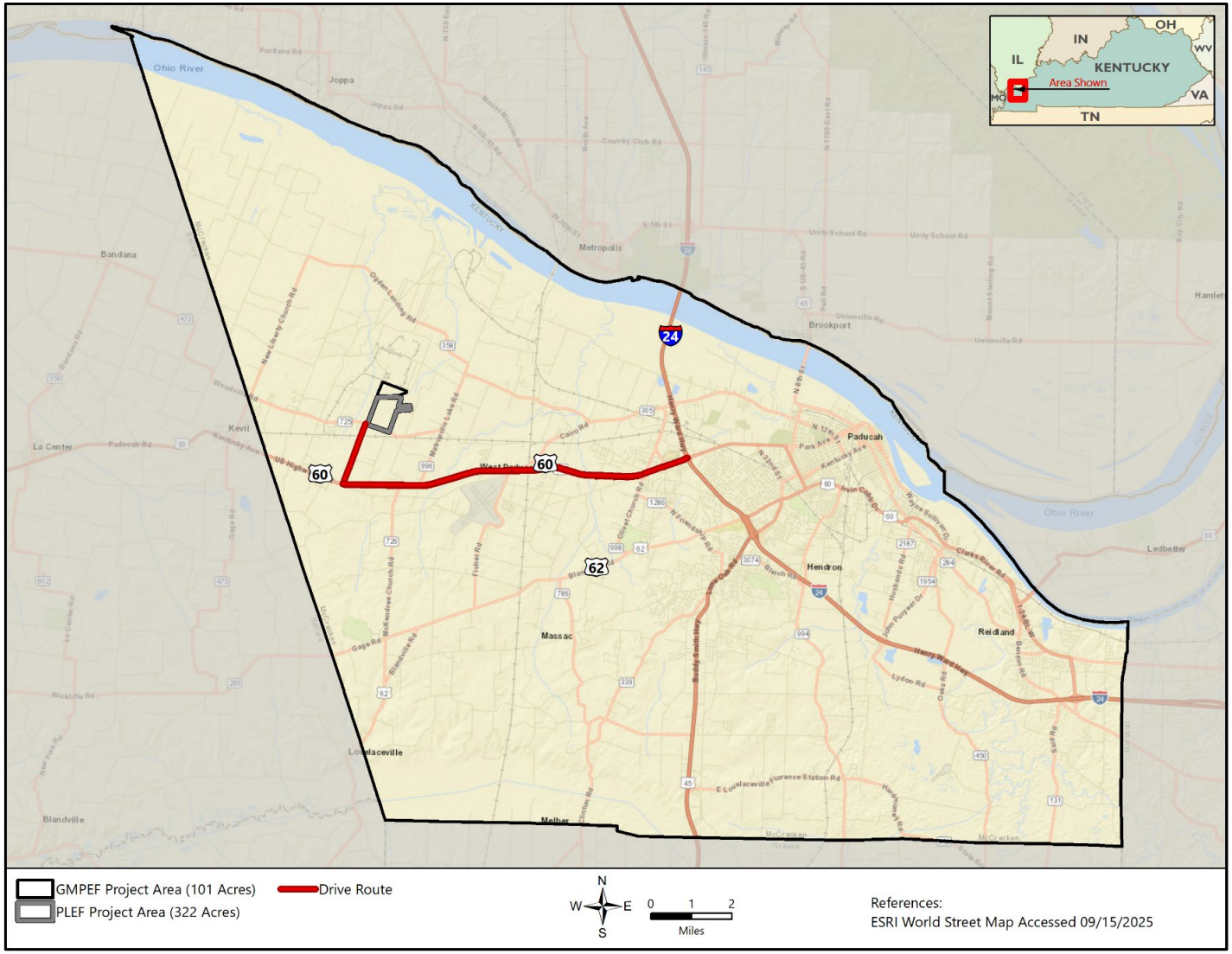


Figure 3-5: Proposed Truck Transportation Route to and from the GMPEF Site

3.2.3 Restrictions on Transportation Corridors

The GMPEF Site is currently zoned MH. Neighboring land uses include heavy industrial, and rural residential uses. There are no known restrictions on the types of materials that may be transported along the routes and corridors that will be used to access the GMPEF Site. The types of hazardous and radioactive materials that will be transported to and from the GMPEF Site are similar to the types of materials that have historically been transported to and from the Paducah Site. This transport of radioactive material will be done in compliance with existing NRC and U.S. Department of Transportation regulations.

3.3 Geology and Soils

This section describes the geology in the region surrounding the GMPEF Site (Section 3.3.1, *Regional Geology*), and at the GMPEF Site (Section 3.3.2, *Geology at the GMPEF Site*). This section also provides general information pertaining to the characteristics of soils of the GMPEF Site (Section 3.3.3, *Soils*), as well as the geotechnical properties of the soils and rocks beneath the GMPEF Site (Section 3.3.4, *Geotechnical Conditions*). In addition to providing information about the regional and site-specific geologic setting, this section provides a brief description of information pertaining to the geologic hazards at the GMPEF Site (Section 3.3.5, *Seismic Hazard Assessment*). Low concentrations of chemical and radionuclides were present within the soils at the GMPEF Site. These are described in Section 3.11, *Public and Occupational Health*. The potential impacts of the Proposed Action on the geology and soils of the GMPEF Site are described in Section 4.4, *Geology and Soils Impacts*.

3.3.1 Regional Geology

This section describes the geology in the region surrounding the GMPEF Site.

3.3.1.1 *Stratigraphy*

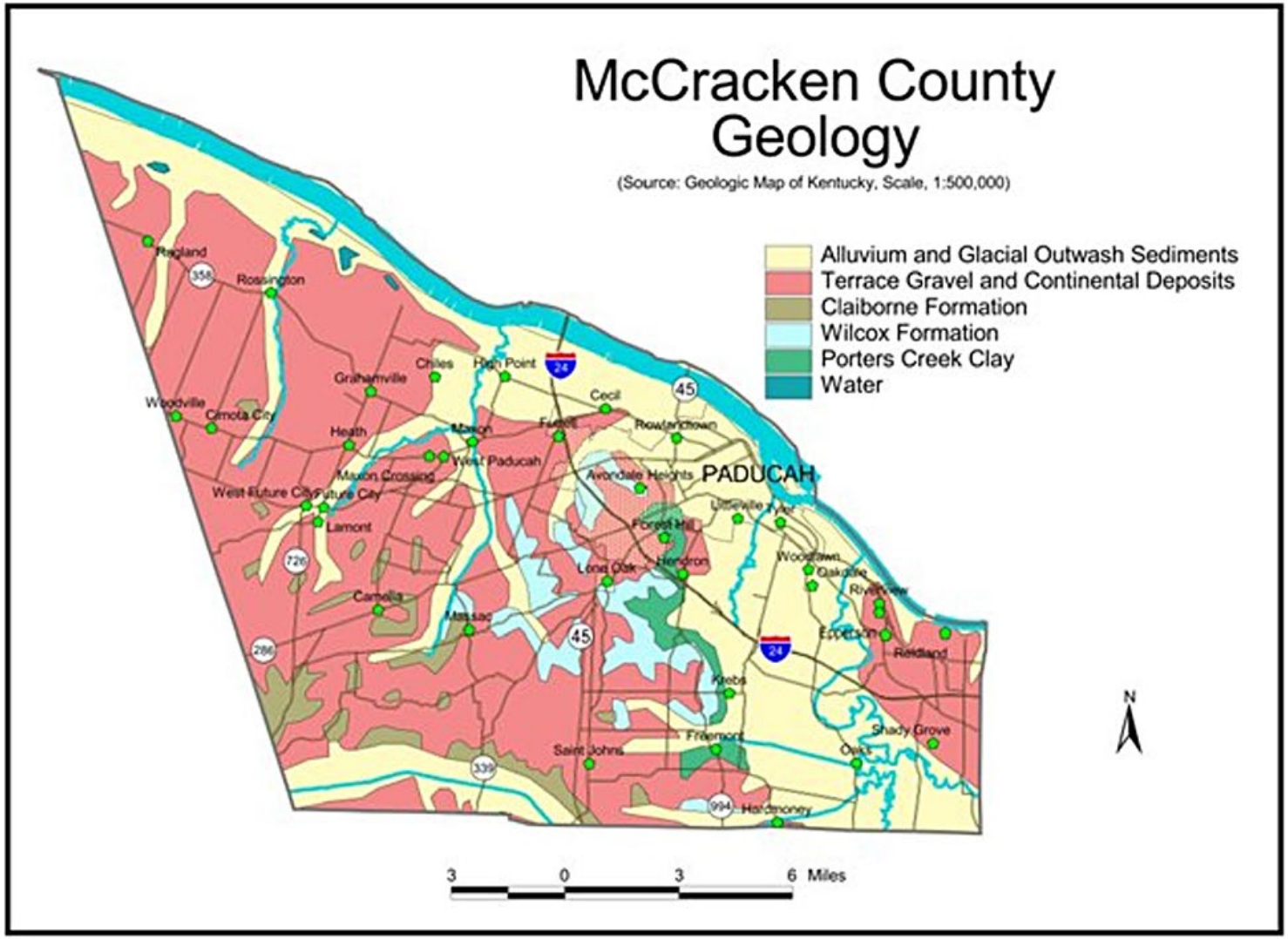
Geologic units exposed at the surface in the vicinity of the GMPEF Site include unconsolidated sediments (Quaternary alluvium, lacustrine, terrace, and loess sediments and Tertiary continental deposits), Wilcox and Claiborne Formations, and upper Cretaceous-Tertiary Clayton and McNairy Formations (Finch, 1966; Martin et al., 2007; NRC, 2026). A map of McCracken County geology is presented on Figure 3-6.

3.3.1.2 *Structure*

This section describes the distribution, position, shape, and internal structures of the geologic formations that may have relevance for faulting and seismicity in the region. Much of this information was taken from the PLEF Draft EIS and GLE ER (NRC, 2026; GLE, 2025).

3.3.1.3 *Reelfoot Rift*

The Reelfoot Rift is a Proterozoic age crustal boundary and a failed intracratonic rift that has been reactivated repeatedly under different stress fields during the Proterozoic through the Tertiary (Nelson, 1998; Bexfield et al., 2005). The rift has a northeastward trend and extends from Arkansas to Southern Illinois and was reactivated by Late Paleozoic deformation thought to be associated with the Ouachita and Alleghenian orogenies (GLE, 2025). Located in the Midcontinent, the Reelfoot Rift is thought to be a failed arm of a Late Precambrian-Early Paleozoic triple junction and was reactivated in the Mesozoic Era to form the current Mississippi Embayment (Keller et al., 1983). Northeast trending faults and grabens extend beneath the Mississippi embayment, displacing Precambrian and Paleozoic age basement rocks and sedimentary deposits (Greb et al., 1992). The origin, reactivation, and orientation of faults in the Reelfoot Rift provide the weak/faulted crust for associated fault zones to form including the Fluorspar Area Fault Complex (FAFC) and the New Madrid Seismic Zone (NMSZ), located near the GMPEF Site (Nelson et al., 1999).



Source: (Pree et al., 1957)

Figure 3-6: McCracken County Surface Geology

3.3.1.4 *Mississippi Embayment/Syncline*

The Mississippi Embayment is a broad, southwest plunging syncline containing approximately 1 mile of Cretaceous and Cenozoic age sediments and with an axis that approximately coincides with the Mississippi River (GLE, 2025; Cox & Van Arsdale, 2002; Martin et al., 2007). Beneath the embayment sediments is a graben basement fault zone known as the early Paleozoic Mississippi Valley Graben Basement Fault Complex (Cox & Van Arsdale, 2002). Originally a topographic and structural dome, the embayment underwent a down-warping in the mid- to late-Cretaceous, which developed the syncline that exists today (GLE, 2025).

Faults that bound the embayment have been active through the Middle Pleistocene, as evidenced by the deformation of Miocene-Pleistocene age gravels in the graben complex (GLE, 2025). Many tectonic faults mapped in Paleozoic bedrock border the embayment to the north and share a similar northeastern trend as the axis of the embayment, most notably, the FAFC. Detailed mapping and cross sections of faults in the FAFC share a similar northeastern trend as the axis of the embayment and are thought to extend beneath the embayment do not exhibit Holocene age deformation (GLE, 2025; Greb et al., 1992).

Even though evidence of Holocene-age deformation is lacking, detailed studies of post Paleozoic Mississippi embayment sediments located north of the embayment provide significant evidence of at least Quaternary-age deformation along structures that share a similar trend and extend into Southern Illinois, in line with the embayment and the seismically active NMSZ, which have been studied in parallel with the Northern Mississippi embayment region (GLE, 2025; Stephenson et al., 1995).

3.3.1.5 *Fluorspar Area Fault Complex*

The FAFC is composed of a group of southwest-northeast trending fault zones that extend beneath the upper Mississippi Embayment and share the general trend of the NMSZ (Nelson et al., 1999). High-angle normal faults outlining horsts and grabens, and some dip-slip and oblique-slip faults, make up the majority of the fault geometries in the FAFC (Nelson et al., 1999). FAFC faults exhibit dip-slip offsets reaching up to 750 meters in some areas (Bexfield et al., 2005). Every fault zone within the FAFC exhibits Quaternary-age deformation and at the edge of the Mississippi embayment also displaces the Late Cretaceous Tuscaloosa and McNairy Formations (Nelson, 1998). The FAFC strikes directly in line with the NMSZ and is believed to share an origin with the seismic zone in a failed Cambrian rift, the Reelfoot Rift (Nelson et al., 1999). Since the opening of the rift in the Cambrian, the FAFC underwent two major reactivation episodes during the Mesozoic and the Late Tertiary (Nelson et al., 1999). Several FAFC fault zones extend into Southern Illinois (Lusk Creek, Raum, Hobbs Creek, Rock Creek, and Barnes Creek Fault Zones) and locally displace Pleistocene deposits (Nelson et al., 1999). Multiple FAFC fault zones extend into the GeM Study Area and are most likely expressed in cross sections beneath Quaternary age sediments, including the northeast-trending Rock Creek Fault Zone and associated Rock Creek Graben (Martin et al., 2007).

According to the U.S. Geological Survey (USGS) Quaternary Fault and Fold Database, Massac County, located just north of the GMPEF Site in Southern Illinois, does contain faults within the FAFC with Late Quaternary age deformation (less than 130,000 years ago) (Nelson et al., 1999). There is an overall lack of Holocene age displacement recorded on the FAFC where it extends north into Southern Illinois, and none of the FAFC faults in Southern Illinois, which extend into Western Kentucky, exhibit contemporary seismicity (GLE, 2025).

3.3.1.6 *New Madrid Seismic Zone*

The NMSZ defines an area of seismic hazard that extends northeastward from Northeast Arkansas through Southeastern Missouri and into Western Kentucky where it bifurcates into western and eastern prongs (Bexfield et al., 2005). The eastern prong trends toward Paducah, Kentucky, and terminates south

of the Ohio River, coinciding with the northern extent of the Mississippi embayment. The western prong trends toward Olmsted, Illinois (Bexfield et al., 2005). The principal compressive stress axis, in Southern Illinois, and extending into Western Kentucky, is oriented North 60°East to East-West, which causes right-lateral slip on the northeast-striking faults in the NMSZ (Nelson et al., 1999).

Slip on NMSZ faults was the cause of the historically infamous 1811–1812 earthquake sequence with moment magnitudes up to 7.5 (USGS, 2019). Between 1811 and 1987, 33 major earthquake events have occurred in the NMSZ area, with epicentral patterns aligning along the northeast-trending axis of the Mississippi embayment (Bexfield et al., 2005; USGS, 1990). The trend of NMSZ seismicity and the faults of the FAFC suggest a possible interrelationship between the two, although as mentioned above, contemporary seismicity is not observed on the FAFC faults that extend northeastward of the Mississippi embayment (GLE, 2025). Recorded seismic activity in the NMSZ is reflected in the USGS 2023 National Seismic Hazard Model (USGS, 2023).

3.3.1.7 *Commerce Geophysical Lineament/Commerce Fault Zone*

The Commerce Geophysical Lineament extends over 250 miles from Arkansas to the Wabash River Valley in Illinois (Bexfield et al., 2005). Primarily a gravity and magnetic feature, the lineament parallels the trend of the Reelfoot Rift but is offset approximately 25 miles to the northwest of the margin of the rift floor (GLE, 2025). Believed to share a trend with a mafic dike swarm in the Proterozoic basement, at least four episodes of Pleistocene and Holocene neotectonism are recorded on the lineament between Illinois and Missouri (GLE, 2025; Bexfield et al., 2005). The lineament may be susceptible to the same stress field that produces NMSZ seismicity and is believed to be associated with the Commerce Fault (located near Commerce, Missouri), which displaces Pliocene and possible Quaternary age deposits (GLE, 2025). This evidence implies that the lineament and fault may be caused by basement structures controlling younger deformation (GLE, 2025).

3.3.2 Geology at the GMPEF Site

Geology within the boundary of the GMPEF Site was studied in early 2026 using geotechnical boreholes and other subsurface exploratory methods (BFW Engineering & Consulting, Inc., 2026a). Fourteen borings were conducted extending 60 to 100 feet below ground surface (bgs), and two additional deep borings were advanced to 667 and 820 feet bgs, respectively. Deep borings were accomplished using sonic drilling for the purposes of compressional and shear wave velocity testing. Subsurface exploration within the GMPEF also included cone penetration testing at 24 locations, Multichannel Analysis of Surface Wave testing (10 locations), and Microtremor Horizontal-to-Vertical Spectral Ratio testing (21 locations). A brief summary of descriptions of the subsurface conditions from the current subsurface investigation is presented in Section 3.3.2.2, *Stratigraphy*.

3.3.2.1 *Topography and Physiography*

The GMPEF is relatively flat ranging in elevation from 385 to 400 feet. The GMPEF Site is located between two small stream valleys: a valley formed by the Bayou Creek is located approximately 1,100 feet west of the GMPEF Site, and the Little Bayou Creek originates just east of the GMPEF Site and is located east of the GMPEF Site. Both creeks flow north into the Ohio River, located approximately 4.2 miles from the northern GMPEF Site boundary. Surface water features are discussed in more detail in Section 3.4, Water Resources.

3.3.2.2 *Stratigraphy*

The stratigraphic sequence found beneath the Paducah Site is as follows (from oldest to youngest): limestone and shale bedrock; Clayton and McNairy Formations, sand with frequent lenses of silt and clay in its upper portions; Porters Creek Clay, silt with sand and clay interbeds; continental deposits, lower gravel or sandy gravel unit and an upper clay-sand unit; and loess, wind-blown silt (DOE, 2020; NRC, 2026).

Information on stratigraphy at the GMPEF Site was derived from testing results and soil samples obtained during the 2026 onsite subsurface exploration, which were interpreted using publicly available documentation (BFW Engineering & Consulting, Inc., 2026a).

3.3.2.2.1 Unconsolidated/Undifferentiated Sediments

Locally, unconsolidated and undifferentiated sediments are composed of clay and silt toward the surface, which coarsen downward to fine to coarse sands with gravels at depth, with silts interspersed within. These sediments are estimated to be alluvium, lacustrine, loess, and continental deposits. Borings conducted during the 2026 subsurface exploration revealed layers of lean clay and silt. In the borings, the cohesive clays and silts often transitioned into granular layers consisting of clayey sand, silty sand, poorly graded sand, silty gravel, and poorly graded gravel typically at depths below 12 feet bgs (BFW Engineering & Consulting, Inc., 2026a).

3.3.2.2.2 Porters Creek Formation

The Porters Creek Formation was identified in borings during the onsite investigation and is locally composed primarily of elastic silt. It was encountered at depths in borings, ranging from 16 to 48 feet bgs, and extends to depths on the order of approximately 100 to 200 feet bgs (BFW Engineering & Consulting, Inc., 2026a).

3.3.2.2.3 McNairy Formation

The McNairy Formation has previously been interpreted as comprising sediments deposited in fluvial and deltaic environments (Nelson & Lumm, 1987). During the 2026 onsite subsurface exploration, two boreholes drilled to depths of 667 and 820 feet, respectively encountered interbedded clays, silts, and sands consistent with the McNairy Formation at depths on the order of 100 to 200 feet bgs. These materials included lean clay, fat clay, silt, poorly graded sand, and silty sand, which are locally thinly bedded or laminated. The McNairy Formation extends to several hundred feet bgs and displays notable vertical variability. At greater depths, both borings encountered extensive gravelly materials dominated by chert gravel with variable sand, silt, and clay content. These materials are variably classified as well graded gravel, gravel with clay, clayey gravel, and silty gravel, with cobbles observed in multiple intervals. Limestone bedrock was encountered at a depth of approximately 820 feet bgs in one boring, and the other boring was terminated at a depth of 667 feet bgs prior to reaching bedrock (BFW Engineering & Consulting, Inc., 2026a).

3.3.2.3 *Economic Geologic Resources*

There are no known economic fossil fuel or mineral deposits beneath the GMPEF Site. Oil and gas are not known to occur in significant quantity in this area of Kentucky and, if coal or other mineral deposits were present, they would occur at a significant depth making recovery difficult and expensive. Clay, sand, and gravel are present but are locally abundant and therefore would not be a unique economic resource (Kentucky Geological Survey, 2001).

3.3.3 Soils

Over time, visually and texturally distinct layers, or soil profiles, develop within the upper horizons of surficial geology deposits. Soil components vary depending on factors including moisture, slope, organic content, and underlying geology.

3.3.3.1 *GMPEF Site Soils*

The distribution of soils within the GMPEF Site is shown on Figure 3-7 and described in this section. The soils information is based on a report generated by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), Web Soil Survey tool (USDA NRCS, 2026a; USDA NRCS, 2026b).

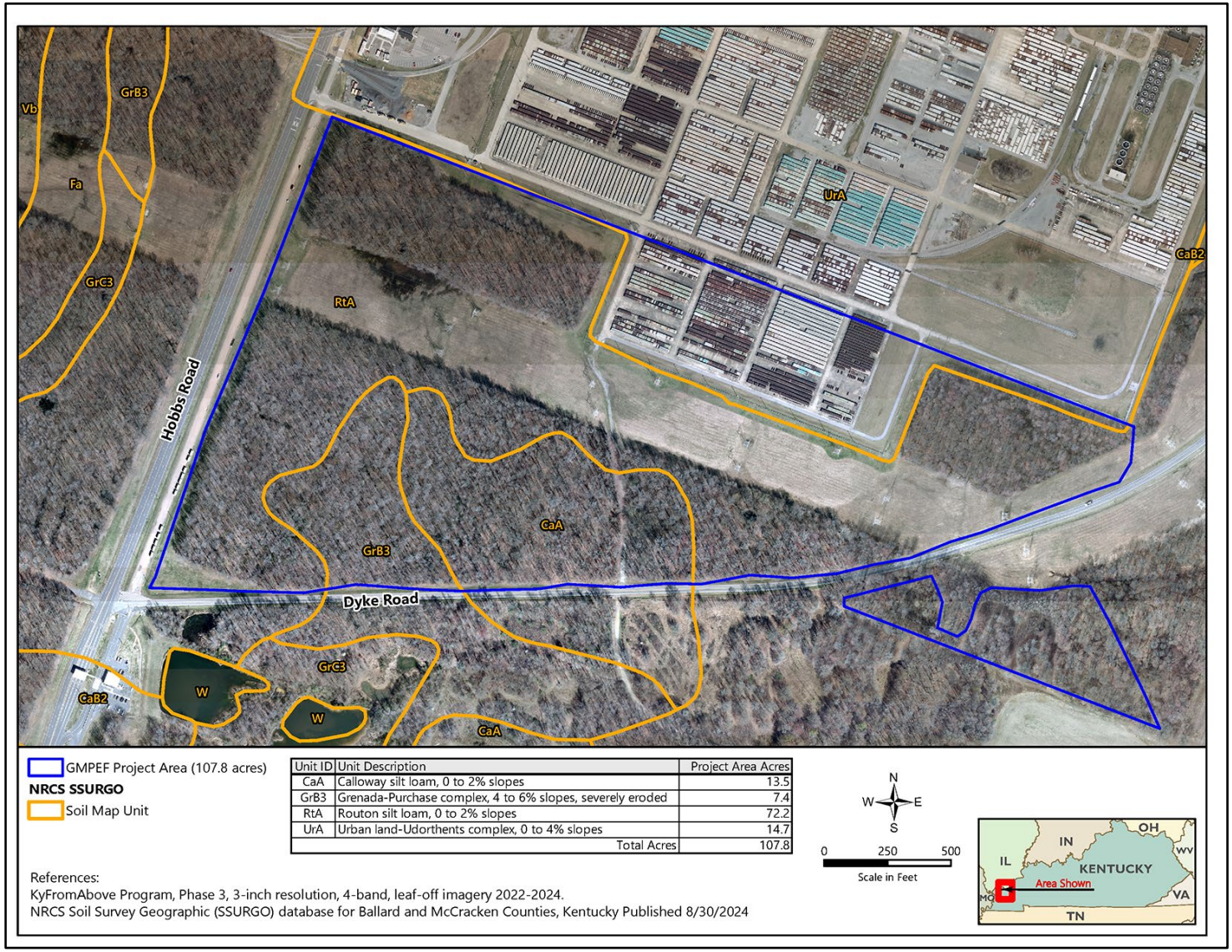


Figure 3-7: Site Soils

3.3.3.2 *Routon Silt Loam*

The Routon Silt Loam covers approximately 67 percent (72 acres) of the GMPEF Site (see Figure 3-7). The Routon silt loam is found on stream terraces with slopes between 0–2 percent. The Routon Silt Loam is composed of fine-silty alluvium with a root restrictive layer greater than 60 inches. The unit is poorly drained and has a low shrink-swell potential (USDA NRCS, 2026a; USDA NRCS, 2026b). The Routon silt loam is Prime Farmland if drained (USDA NRCS, 2025).

3.3.3.3 *Urban Land (Soil Type)*

Urban Land-Udorthents Complex is present on slopes of 0–4 percent. Urban land soils cover approximately 14 percent (15 acres) of the GMPEF Site (see Figure 3-7) (USDA NRCS, 2026a; USDA NRCS, 2026b).

3.3.3.4 *Calloway Silt Loam*

The Calloway silt loam covers approximately 13 percent (14 acres) of the GMPEF Site (see Figure 3-7). The Calloway silt loam is a flat-lying unit found on upland broad flats with slopes between 0–2 percent and is somewhat poorly drained. The Calloway silt loam is primarily composed of thick fine-silty noncalcareous loess with a fragipan at depths of 14–38 inches. Soil permeability is moderately low in the fragipan layer of the soil unit and shrink-swell potential is low (USDA NRCS, 2026a; USDA NRCS, 2026b). The Calloway silt loam is Prime Farmland if drained (USDA NRCS, 2025).

3.3.3.5 *Grenada Silt Loam*

The Grenada silt loam covers approximately 7 percent (7 acres) of the GMPEF Site (Figure 3-7). The Grenada silt loam is found with slopes between 4–6 percent on broad ridges on uplands. The Grenada is primarily composed of thick fine-silty noncalcareous loess with a fragipan at depths of 17–38 inches. The Grenada is moderately well drained and has low shrink-swell potential (USDA NRCS, 2026a; USDA NRCS, 2026b). The Grenada silt loam is Farmland of Statewide Importance (USDA NRCS, 2025).

3.3.3.6 *Ground Stability and Soils within the GMPEF Site*

Characteristics of the soil and underlying geology are being considered as part of the design process to prevent damage to the GMPEF. Differences in settlement of a foundation, or differential settlement, are being considered in the design process for GMPEF facilities and supporting infrastructure. The soils identified in Section 3.3.3.1, *GMPEF Site Soils*, are found within the GMPEF Site. Soil characteristics that can be used to identify the potential for differential settlement include high clay content.

In addition to differential settlement, the proximity of the GMPEF Site to the NMSZ suggests soil liquefaction (flow and cyclic) should be considered during the design process. Geotechnical conditions at the GMPEF Site relating to seismic hazard are discussed in Section 3.3.5, *Seismic Hazard Assessment*.

Soil remediation may be performed in locations where it is determined that soil liquefaction is a concern.

3.3.4 Geotechnical Conditions

The geotechnical considerations outlined in this section are based on geotechnical explorations conducted in 2026, which included testing at the locations shown on Figure 3-8 (BFW Engineering & Consulting, Inc., 2026a).

3.3.4.1 *General Site Properties*

The local geology can be summarized as consisting of a surface layer of loess and alluvial continental deposits consisting of gravel, sand, silt, and clay that overlay deposits of clay interbedded with sands and silt. Hard limestone underlays the area (NRC, 2026). Figure 3-9 provides a south-north cross section of the site geology including the generalized locations of the GMPEF Site, the DOE PGDP, and the Ohio River.

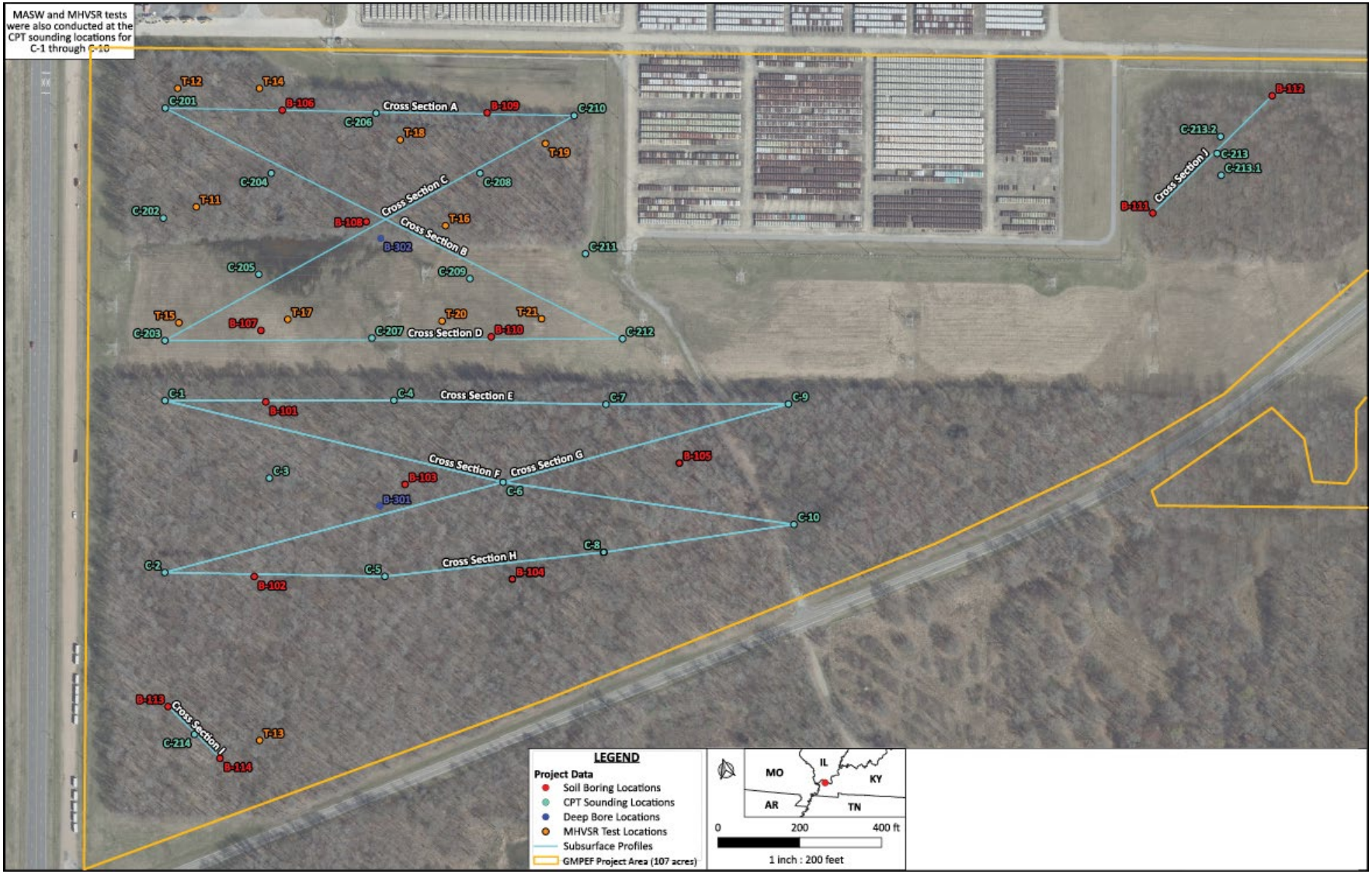


Figure 3-8: Testing Locations During 2026 GMPEF Geotechnical Exploration

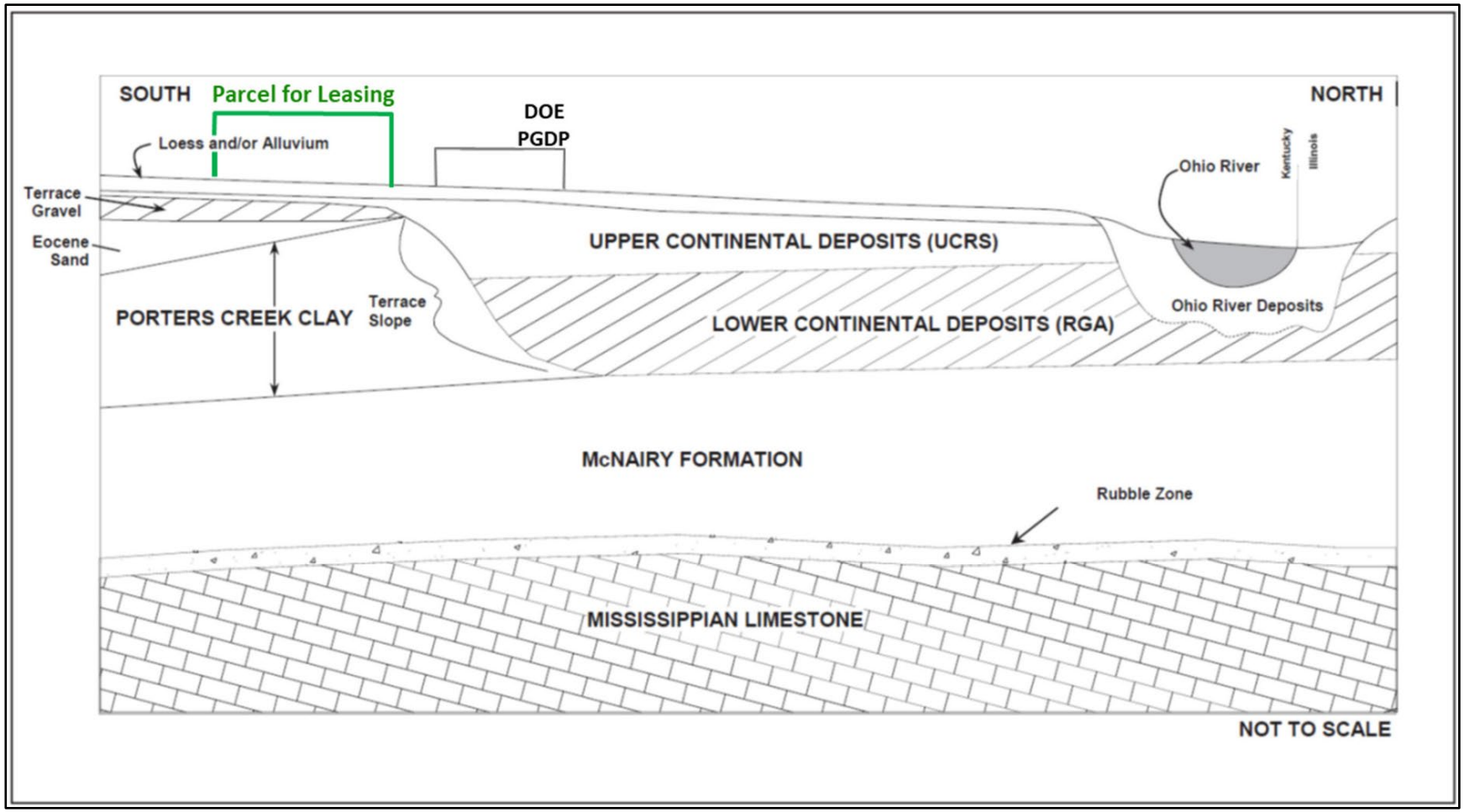


Figure 3-9: Cross Section Showing Geologic Relationships at the DOE Paducah Site

As discussed in Section 3.3.2.2*, Stratigraphy*, unconsolidated sediments transition to Porters Creek Formation at depths ranging from 16 to 48 feet bgs in boreholes drilled during the 2026 geotechnical exploration. The shallowest unconsolidated sediments exhibited moisture contents of 11 to 31 percent and standard penetration test values of 0 to 29 blows per foot (bpf) indicating a very soft to very stiff consistency. At depths greater than about 12 feet bgs, the cohesive clays and silts often transitioned into granular layers consisting of clayey sand, silty sand, poorly graded sand, silty gravel, and poorly graded gravel. Moisture contents of these materials ranged from about 9 to 23 percent with blow counts of 13 to over 50 bpf, indicating a firm to very dense relative density. In the Porters Creek Formation, materials encountered had moisture contents of about 43 to 71 percent and blow counts of 8 to 48 bpf, indicating a firm to hard consistency. The Clayton-McNairy Formation was encountered below the Porters Creek Formation layer at depths on the order of 100 to 200 feet bgs. Limestone bedrock was encountered at a depth of approximately 820 feet bgs in one boring, and the other boring was terminated at a depth of 667 feet bgs prior to reaching bedrock (BFW Engineering & Consulting, Inc., 2026a) A boring log for a GMPEF borehole sample, reproduced on Figure 3-10, exemplifies typical GMPEF stratigraphic progression**.**

Atterberg limit tests conducted on representative samples taken from boreholes B-102 through B-110 showed plasticity indices ranging from 7 (medium plastic) to 32 (high plastic) at depths ranging from 6 to 43 feet bgs. Soil types recorded were classified as lean clay, fat clay, or elastic silt (BFW Engineering & Consulting, Inc., 2026a).

Shear wave velocities of materials were measured in-situ. Examples of idealized profiles of shear wave velocity compatible within the soil profile are illustrated on Figure 3-11. When averaged across all test locations, the GMPEF Site has a weighted average shear wave velocity in the upper 100 feet in the range of 800 feet per second to 900 feet per second, indicative of seismic design Site Class D. Higher shear wave velocities were found to exist in deeper strata (BFW Engineering & Consulting, Inc., 2026a).

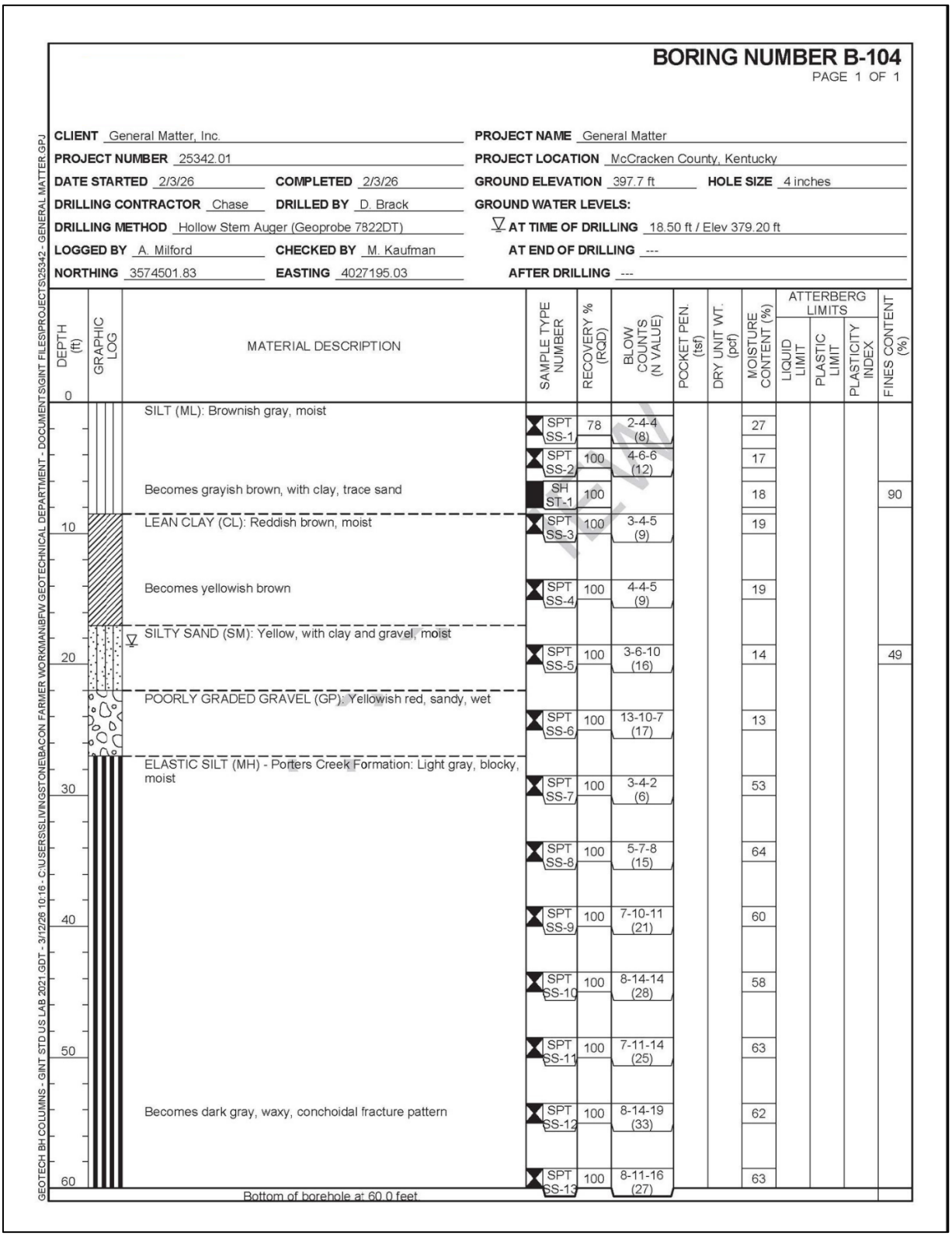
3.3.4.2 *Subsurface Exploration*

A subsurface investigation was completed at the GMPEF Site in 2026, using field test procedures as described in Section 3.3.2, *Geology at the GMPEF Site* (BFW Engineering & Consulting, Inc., 2026a). Site characterization locations at the GMPEF Site are shown on Figure 3-8. Laboratory testing of soils (e.g., moisture content, Atterberg Limits, grain size analysis, unconfined compressive strength, and consolidated undrained triaxial compression).

As part of performing investigations related to leasing the land to GeM (DOE, 2025a), DOE evaluated existing soil data from its extensive monitoring network to determine if contamination exists at the GMPEF Site. Chemical contaminants of potential concern include cadmium, chromium as Cr(IV), chromium as Cr(III), and manganese. A single radiological contaminant of potential concern, U-238, was identified on the GMPEF Site (DOE, 2026b). See Section 3.11, *Public and Occupational Health*, for information related to soil contamination.

3.3.5 Seismic Hazard Assessment

Hundreds of earthquakes occurred in the Northern Mississippi embayment, where the GMPEF Site is located, from 1811 to 1812 (Odum et al., 2002). The interpreted seismic source area for these events is within the interpreted area of the NMSZ (Odum et al., 2002). Figure 3-12 demonstrates the recorded earthquakes surrounding the NMSZ, illustrating why the NMSZ and surrounding areas are commonly recognized as the most seismically active region in North America east of the Rocky Mountains (DOE, 2015a). The Reelfoot Rift, which trends northeast from the NMSZ beneath the Mississippi Embayment into Southern Illinois, is suspected to play a major role in the localization of earthquakes in the NMSZ (GLE, 2025). The GMPEF is in relatively close proximity to the NMSZ. Of note is the series of large (up to 7.5 magnitude) earthquakes (and aftershocks) from December 1811 to February 1812 (Table 3-6). The USGS estimates the location of the 7.3 magnitude event in February 1812 at about 44 miles from the GMPEF Site; the other 1811/1812 events are estimated to be centered between about 60 and 150 miles from the GMPEF Site (GLE, 2025).



BORING NUMBER B-104
PAGE 1 OF 1

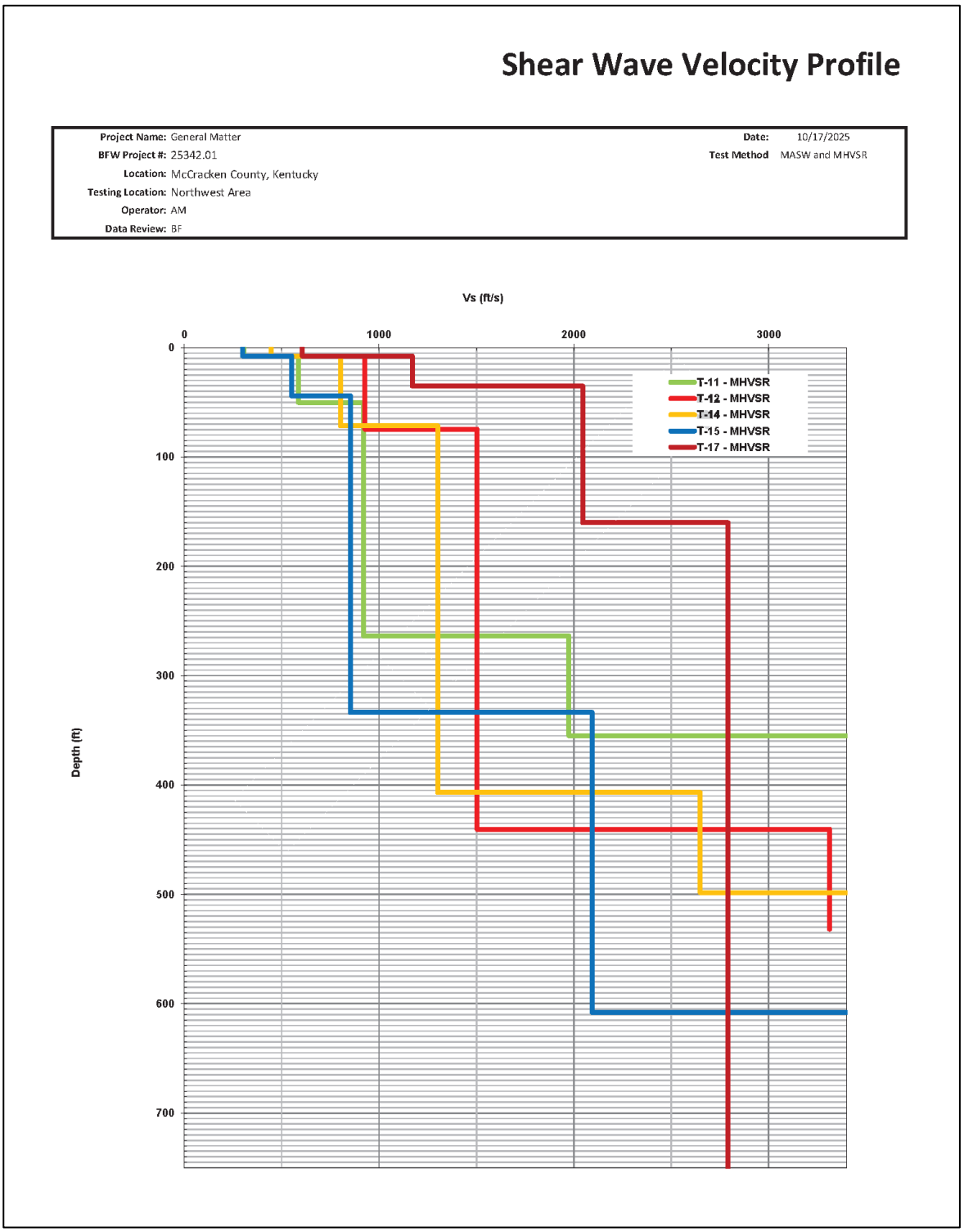
CLIENT General Matter, Inc. **PROJECT NAME** General Matter
PROJECT NUMBER 25342.01 **PROJECT LOCATION** McCracken County, Kentucky
DATE STARTED 2/3/26 **COMPLETED** 2/3/26 **GROUND ELEVATION** 397.7 ft **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Chase **DRILLED BY** D. Brack **GROUND WATER LEVELS:**
DRILLING METHOD Hollow Stem Auger (Geoprobe 7822DT) ▽ **AT TIME OF DRILLING** 18.50 ft / Elev 379.20 ft
LOGGED BY A. Milford **CHECKED BY** M. Kaufman **AT END OF DRILLING** ---
NORTHING 3574501.83 **EASTING** 4027195.03 **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SILT (ML): Brownish gray, moist	SPT SS-1	78	2-4-4 (8)			27				
			SPT SS-2	100	4-6-6 (12)			17				
		Becomes grayish brown, with clay, trace sand	SH ST-1	100				18				90
10		LEAN CLAY (CL): Reddish brown, moist	SPT SS-3	100	3-4-5 (9)			19				
		Becomes yellowish brown	SPT SS-4	100	4-4-5 (9)			19				
		▽ SILTY SAND (SM): Yellow, with clay and gravel, moist	SPT SS-5	100	3-6-10 (16)			14				49
20		POORLY GRADED GRAVEL (GP): Yellowish red, sandy, wet	SPT SS-6	100	13-10-7 (17)			13				
		ELASTIC SILT (MH) - Porters Creek Formation: Light gray, blocky, moist	SPT SS-7	100	3-4-2 (6)			53				
30			SPT SS-8	100	5-7-8 (15)			64				
			SPT SS-9	100	7-10-11 (21)			60				
40			SPT SS-10	100	8-14-14 (28)			58				
			SPT SS-11	100	7-11-14 (25)			63				
50		Becomes dark gray, waxy, conchoidal fracture pattern	SPT SS-12	100	8-14-19 (33)			62				
			SPT SS-13	100	8-11-16 (27)			63				
60		Bottom of borehole at 60.0 feet.										

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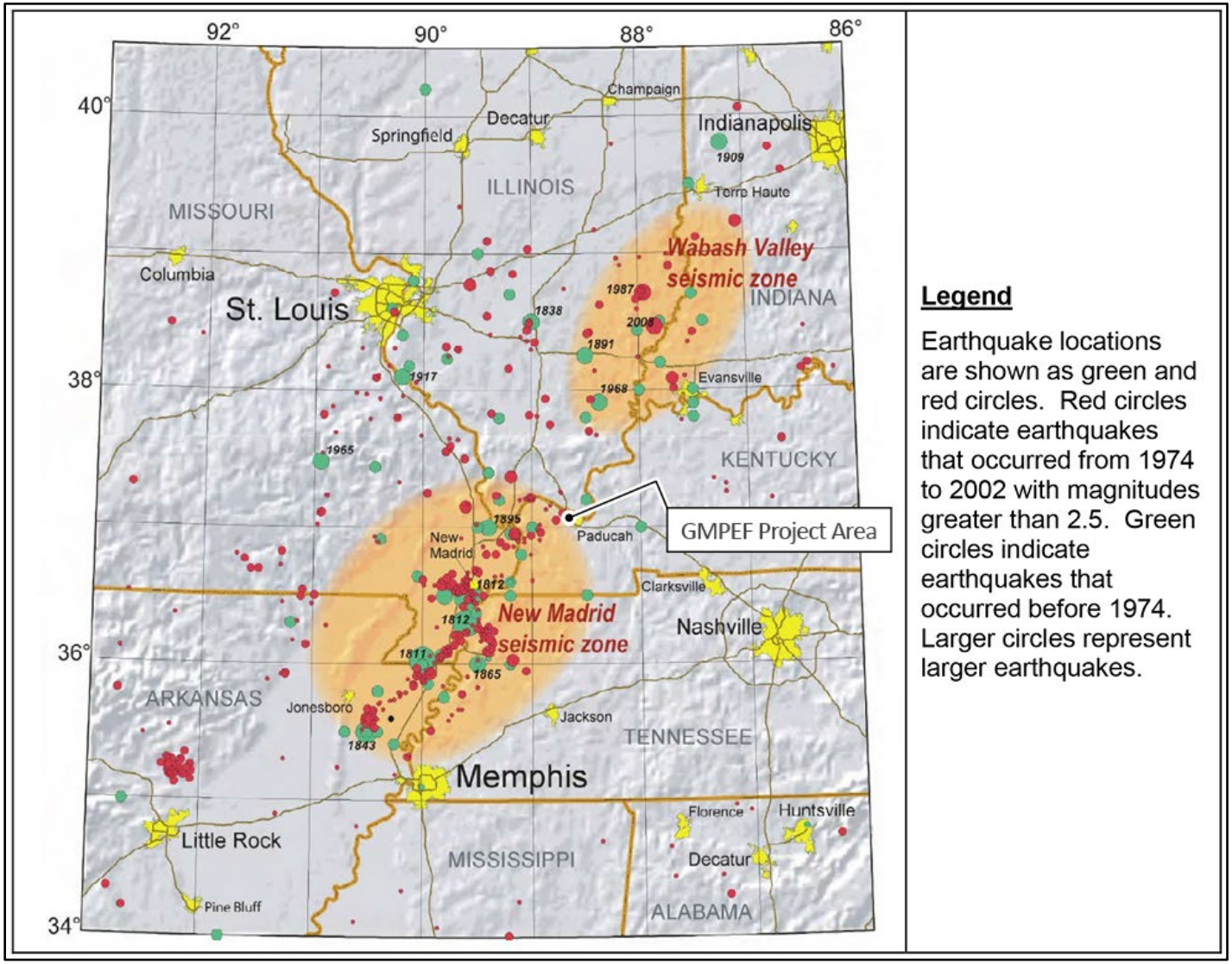
Source: (BFW Engineering & Consulting, Inc., 2026a)

Figure 3-10: Soil Boring Log Example (Location B-104)



Source: (BFW Engineering & Consulting, Inc., 2026a)

Figure 3-11: Shear Wave Velocity Plot Example (at Locations T-11 through T-17)



Source: (DOE, 2015a)

Figure 3-12: Map of New Madrid and Wabash Valley Seismic Zones

Table 3-6: Magnitude and Location of New Madrid Earthquakes of 1811–1812 (Three Largest)

Magnitude (MMI)	Date	Location
M ~ 7.5	December 16, 1811	Northeast Arkansas
M ~ 7.3	January 23, 1812	New Madrid, Missouri
M ~ 7.5	February 7, 1812	New Madrid, Missouri

Source: USGS (2019)
Key: MMI = Modified Mercalli Intensity

The 2023 update of the National Seismic Hazard Model defines the potential for ground shaking for various probability levels across the conterminous United States. The GMPEF Site is located in a relatively high seismic hazard area, as indicated by the USGS Seismic Hazard Intensity Map depicted on Figure 3-13 (USGS, 2024b). Geology and soils information required to understand site safety and accidents is presented in more detail in the safety analysis documents.

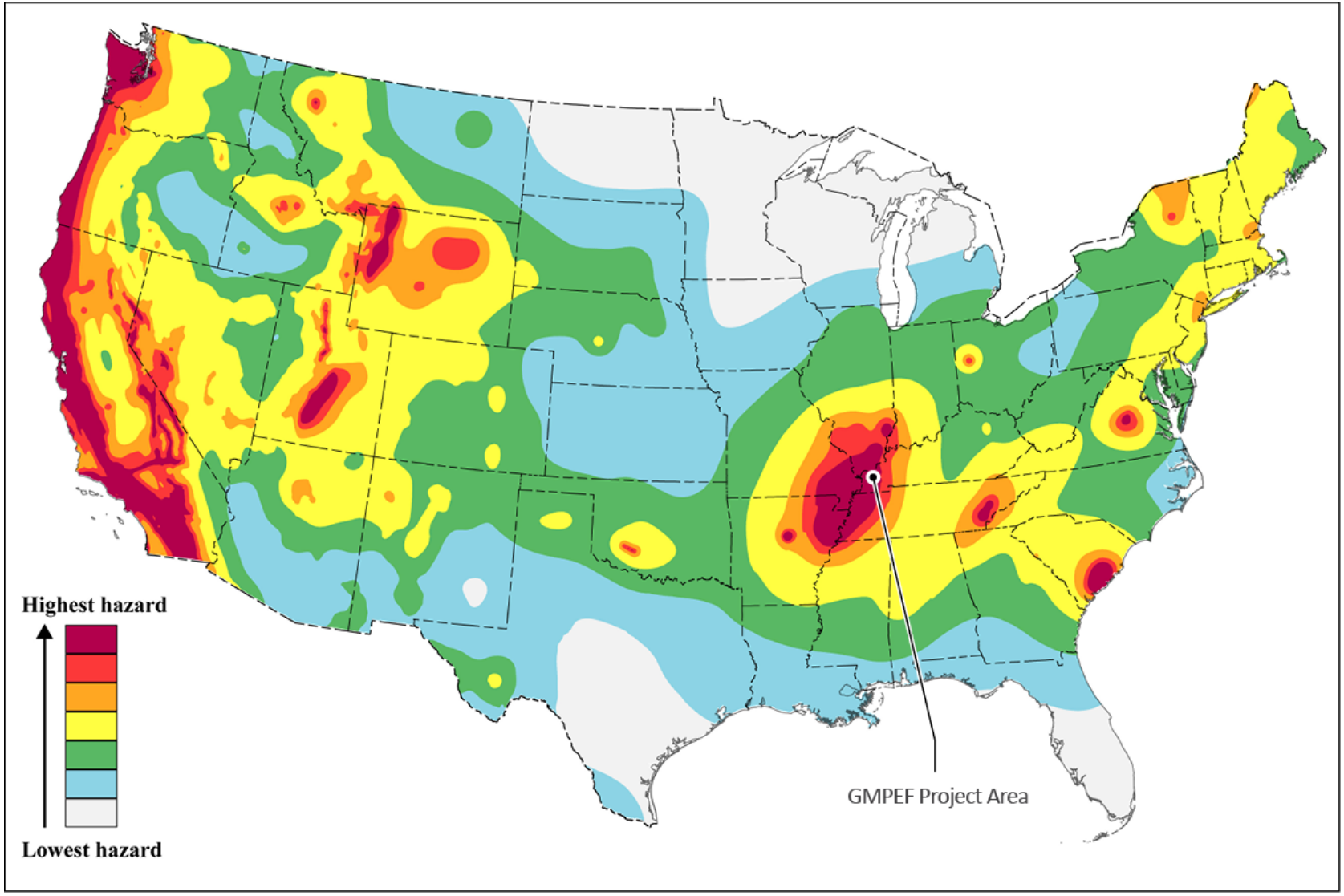
A site-specific geotechnical study (BFW Engineering & Consulting, Inc., 2026b) determined that the GMPEF Site is susceptible to liquefaction during the Maximum Considered Earthquake event, which has a moment magnitude of 7.5 and a preliminary peak ground acceleration of 0.74 g. Soils at the site between the near-surface loess deposits and the Porter's Creek Clay Formation are characterized as Pleistocene-age continental deposits. The continental deposits at the site consist of discontinuous zones of potentially liquefiable soils.

3.3.5.1 *Other Potential Geologic Hazards*

Several other types of potential geologic hazards were considered and found to not be credible and therefore are not discussed further. They include the following:

- Volcanic activity. There is no current volcanic activity in the region or in the vicinity of the GMPEF Site and none is expected; therefore, volcanic activity is not considered to be a potential geologic hazard at this site and is not discussed further.
- Possibility of landslides. Steep slopes along stream beds are found throughout McCracken County, these slopes can develop soil creep and landslides (Beck et al., 2004). There are no steep slopes at the GMPEF Site; therefore, landslides are not considered to be a potential geologic hazard at this site and are not discussed further.
- Karst geology and sinkholes. There are no instances of sinkholes or prominent karst geology in McCracken County; therefore, sinkholes and karst geology are not considered to be a potential geologic hazard at this site and are not discussed further.

The proposed GMPEF Site is situated in an are awith none to low indoor radon potential, meaning that the average level of radon is between 0 and 2.7 picocuries per liter (pCi/L) (Kentucky Geological Survey, 2026). Based on NRCS soil descriptions and visual inspections, an amount of organic matter that is considered normal is present at the GMPEF Site. Three landfills were identified at the neighboring Paducah Site, located approximately 2.5 miles from the GMPEF Site. Permits for the landfills indicate storage of dry waste, building materials, and waste produced at the site and are not believed to produce methane (GLE, 2025). As a result, methane is not considered to be a potential hazard at the GMPEF Site.



Source: USGS (2024b)

Figure 3-13: USGS Seismic Hazard Intensity Map (2 percent probability of exceedance in 50 years)

3.4 Water Resources

This section provides a summary of existing water resource conditions associated with the GMPEF Site, including groundwater (Section 3.4.1), surface waters (Section 3.4.2), floodplains (Section 3.4.3), wetlands (Section 3.4.4), and water use (Section 3.4.5). Additional details for the Paducah Site and the region surrounding the site are presented in the PLEF Draft EIS (NRC, 2026).

3.4.1 Groundwater

This section describes groundwater conditions associated with the GMPEF Site, including a description of regional and site aquifers, preexisting regional and site groundwater impacts, and existing site groundwater remediation. In this section, the region is defined as the two counties, McCracken and Ballard, surrounding the GMPEF Site that are most likely to incur impacts due to the Proposed Action, and the GMPEF Site area generally refers to the GMPEF Site vicinity, including an area within approximately 3 miles of the GMPEF Site property boundary.

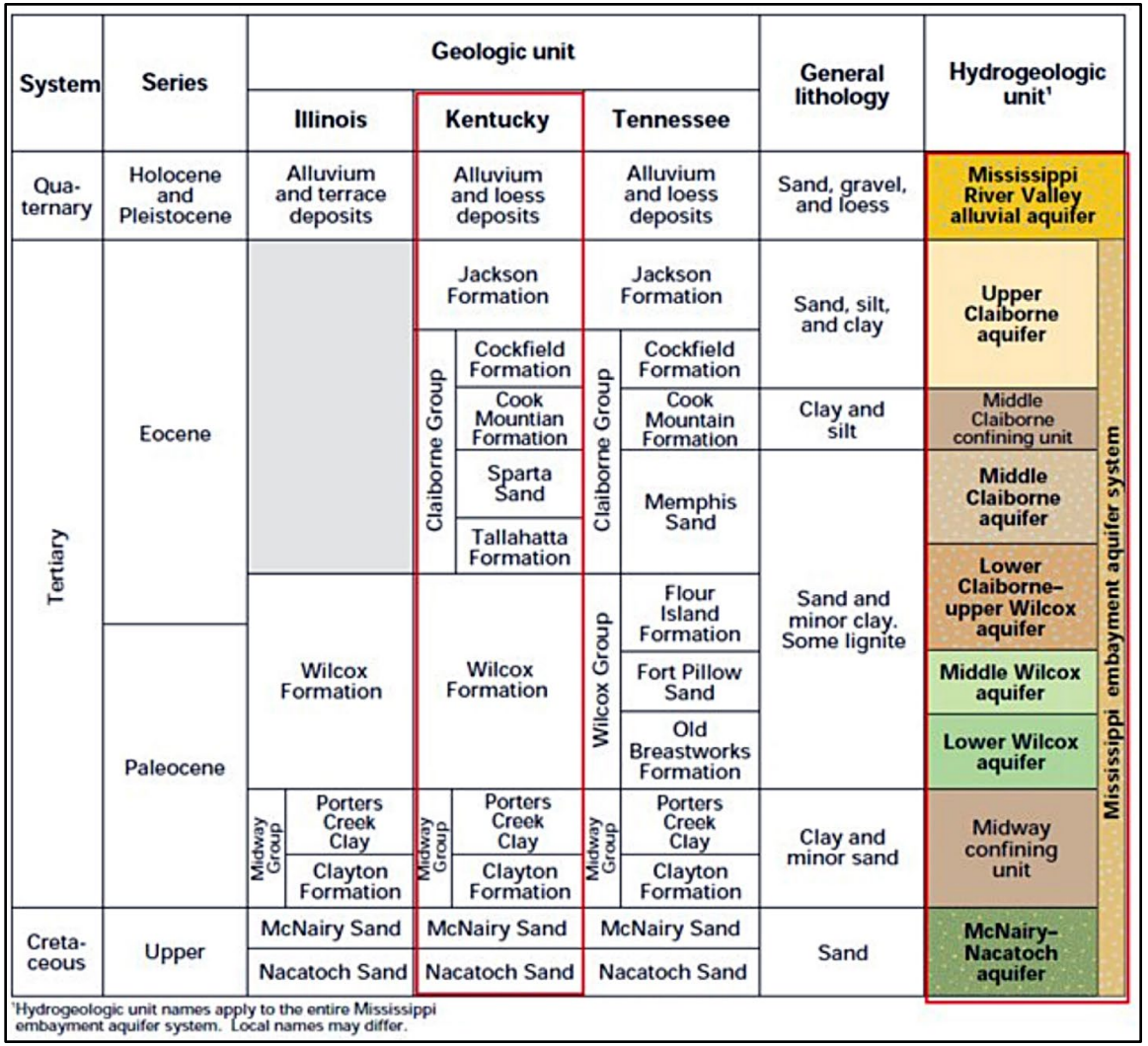
3.4.1.1 *Aquifers and Confining Layers*

This section presents discussions of the regional and GMPEF Site aquifers and their associated confining or semi-confining units.

3.4.1.1.1 Regional Aquifers and Confining Layers

The GMPEF Site is within the far northeastern extents of the upper Mississippian embayment physiographic region of the much larger Coastal Plain geographic province, where it terminates north of the Ohio River approximately 10 miles north of the GMPEF Site (McGrain, 1983; Parola et al., 2005; Mater et al., 2009; NRC, 2026). On a regional scale, the Mississippian embayment aquifer system is made up of a thick, north-south trending, Mississippian-age carbonate bedrock trough, infilled with overlying Cretaceous, Tertiary, and Quaternary aged unconsolidated clastic sediments (GLE, 2025; Brahana & Mesko, 1988; Carey & Stickney, 2004) that are described in Section 3.3.1, *Regional Geology*.

Each hydrogeologic unit is generally made up of one or more sequences of water-yielding higher relative permeability (aquifer) units alternating with finer-grain non-water-yielding low permeability (confining or semi-confining) units that bound each aquifer unit with an overlying and/or underlying confining unit. The aquifers generally correspond to geologic formations as described in Section 3.3.1, *Regional Geology*; Figure 3-14 shows the Mississippi embayment hydrogeologic units in the region, illustrating the general stratigraphic relationship between the regional hydrogeologic units. The Lower Wilcox aquifer, Midway confining unit, and the McNairy-Nacatoch aquifer are present in the vicinity of the GMPEF Site and have been included in the regional aquifer discussion due to their importance as an aquifer unit and occurrence in Ballard County and Southwest McCracken County, Kentucky (Hosman & Weiss, 1991; NRC, 2026). This section provides a description of each regional aquifer and its associated confining unit(s) (if present) in order of descending stratigraphic position.



Sources: (GLE, 2025; 1986; Williamson et al., 1990; Hosman & Weiss, 1991)

Figure 3-14: Regional Stratigraphy and Mississippi Embayment Aquifer System Hydrogeologic Units in Western Kentucky

3.4.1.1.1.1 Lower Wilcox Aquifer

The Lower Wilcox aquifer is the second most extensively developed aquifer in the Mississippi Embayment aquifer System (GLE, 2025; Arthur & Taylor, 1998). The Lower Wilcox aquifer is primarily made up of fine to coarse grain massively bedded sand deposits of the Lower Wilcox Formation, similar to present-day Mississippi flood plain deposits (GLE, 2025; Pree & Walker, 1953; Hosman & Weiss, 1991). The Lower Wilcox aquifer sands are primarily interconnected laterally (GLE, 2025; Arthur & Taylor, 1998). Total thickness of the Lower Wilcox aquifer is typically less than 400 feet with transmissivity values generally greater than 5,000 square feet per day (GLE, 2025; Arthur & Taylor, 1990; Hosman & Weiss, 1991; Arthur & Taylor, 1998). Average hydraulic conductivity for the Lower Wilcox aquifer is 85 feet/day (GLE, 2025; Brahana & Mesko, 1988). The Lower Wilcox aquifer's northeastern updip limit reaches the land surface in Central Ballard County and Southwest McCracken County, Kentucky, with a total thickness of approximately 100 feet or less (GLE, 2025; Arthur & Taylor, 1990; Hosman & Weiss, 1991).

3.4.1.1.1.2 Midway Confining Unit

The Midway confining unit is the regional no-flow boundary that hydraulically separates the Tertiary aquifers from the Cretaceous aquifers in the Mississippi Embayment aquifer system except for a small area in the northeastern part of the embayment where the possibility for movement of groundwater between the underlying Cretaceous and overlying Tertiary aquifers exists due to outcropping and thinning of the Midway confining unit (GLE, 2025; Brahana & Mesko, 1988; Hosman & Weiss, 1991). This area includes Western Kentucky (Ballard and McCracken Counties) (GLE, 2025; Arthur & Taylor, 1990; Hosman & Weiss, 1991; Arthur & Taylor, 1998). The Midway confining unit is composed almost entirely of dense marine clay and shale of the Midway Group (Porters Creek Clay and Clayton Formation); however, where the immediately underlying Cretaceous deposits consist of low-permeability silts and clays, they are also included in the Midway confining unit (see Figure 3-14) (GLE, 2025; Hosman & Weiss, 1991). The Midway confining unit is typically less than 200 feet thick in its updip limits with areas downdip increasing to a maximum thickness of 1,000 feet near the axis of the Mississippi embayment (GLE, 2025; Hosman & Weiss, 1991; Arthur & Taylor, 1998). Average vertical hydraulic conductivity in the Midway confining unit is estimated to be less than $1x10^{-5}$ feet/day (GLE, 2025; Arthur & Taylor, 1998). Very low hydraulic conductivity retards groundwater flow between the Tertiary and Cretaceous aquifers; however, the Porters Creek Clay Formation, included in the Midway Group, has been noted to contain irregularly spaced, vertically oriented sand dikes, allowing for some vertical flow from the overlying Tertiary aquifer units into the underlying Cretaceous aquifer units (see Figure 3-14) (GLE, 2025; Pree & Walker, 1953; Brahana & Bradley, 1986; Arthur & Taylor, 1998; Clark et al., 2011). The Midway confining unit's northeastern updip limit subcrops in Ballard County and Southwest McCracken County, Kentucky, with an approximate total thickness of less than 100 feet (GLE, 2025; Arthur & Taylor, 1990; Hosman & Weiss, 1991).

3.4.1.1.1.3 McNairy-Nacatoch Aquifer

The McNairy-Nacatoch aquifer directly underlies the Midway confining unit and is the lowermost hydrogeologic unit included in the Mississippi Embayment aquifer system (see Figure 3-14) (GLE, 2025; Hosman & Weiss, 1991). The McNairy-Nacatoch aquifer is generally hydraulically separated from the overlying Tertiary aquifers throughout most of the Mississippi Embayment aquifer system by the Midway confining unit; however, in the northern extents of the embayment, where the Midway confining unit is thin or sand dikes cross-cut through the Porters Creek Clay, the aquifer is hydraulically connected to the overlying Tertiary aquifers (GLE, 2025; Brahana & Mesko, 1988). Due to the hydraulic connection between the McNairy-Nacatoch aquifer and the overlying aquifers in Tertiary rocks (in the northern part of the Mississippi Embayment where the Midway confining unit is thin), this aquifer is included in the Mississippi

Embayment aquifer system (GLE, 2025; Pree et al., 1957; Arthur & Taylor, 1998). The McNairy-Nacatoch aquifer primarily consists of the McNairy Sand in Illinois, Kentucky, and Tennessee, but also includes the Nacatoch sand where present (Hosman & Weiss, 1991). Sands in the McNairy-Nacatoch aquifer are generally present as either one single bed or as two or more sand beds separated by thinner clay or marl layers, which, in turn, are overlain by clays of the Midway confining unit (GLE, 2025; Brahana & Mesko, 1988). The clean, fine sand facies change laterally to clay, marl, and limestone toward the southwest within the embayment, and are accompanied by calcareous cementation that fills the pore space between sand grains and greatly reduces the permeability of the sand as you move downdip within the Mississippi Embayment (GLE, 2025; Arthur & Taylor, 1998). The McNairy-Nacatoch aquifer thickens from less than 50 feet near its updip limit to a maximum of more than 400 feet downdip near the axis of the Mississippi Embayment (GLE, 2025; Brahana & Mesko, 1988; Hosman & Weiss, 1991; Arthur & Taylor, 1998). The average hydraulic conductivity of the McNairy-Nacatoch aquifer is 50 feet/day with transmissivity values ranging from 270 to 4,300 square feet/day (GLE, 2025; Brahana & Mesko, 1988).

3.4.1.2 *GMPEF Site Aquifers and Confining Units*

The primary water-bearing units beneath the GMPEF Site include undifferentiated Quaternary alluvium deposits, Pliocene gravel deposits (Regional Gravel aquifer), Holly Springs Sand Formation (Middle-Lower Wilcox aquifer), and the McNairy-Nacatoch aquifer (DOE, 2025a; GLE, 2025; Pree & Walker, 1953). The semi-confining and confining units at the GMPEF Site include the Pleistocene loess and the Porters Creek clay (DOE, 2025a; GLE, 2025; Pree & Walker, 1953). A general overview of the water-bearing characteristics of the hydrogeologic units at the GMPEF Site is presented in Table 3-7. A generalized cross section showing the stratigraphic relationship of the GMPEF Site aquifers and semi-confining/confining units is presented in (GLE, 2025; Pree et al., 1957). There are no U.S. Environmental Protection Agency (EPA)-designated sole-source aquifers at or in the vicinity of the GMPEF Site (EPA, 2025a).

An onsite subsurface investigation to characterize the subsurface conditions at the nearby PLEF Site was completed (GLE, 2025). Soil borings and monitoring well nests were completed to identify formations and aquifers present beneath the site. Groundwater elevations were gauged during and in subsequent sampling events following the completion of the onsite subsurface investigation to better understand seasonal variability in the aquifers present at the PLEF Site.

3.4.1.2.1 Surficial Aquifers

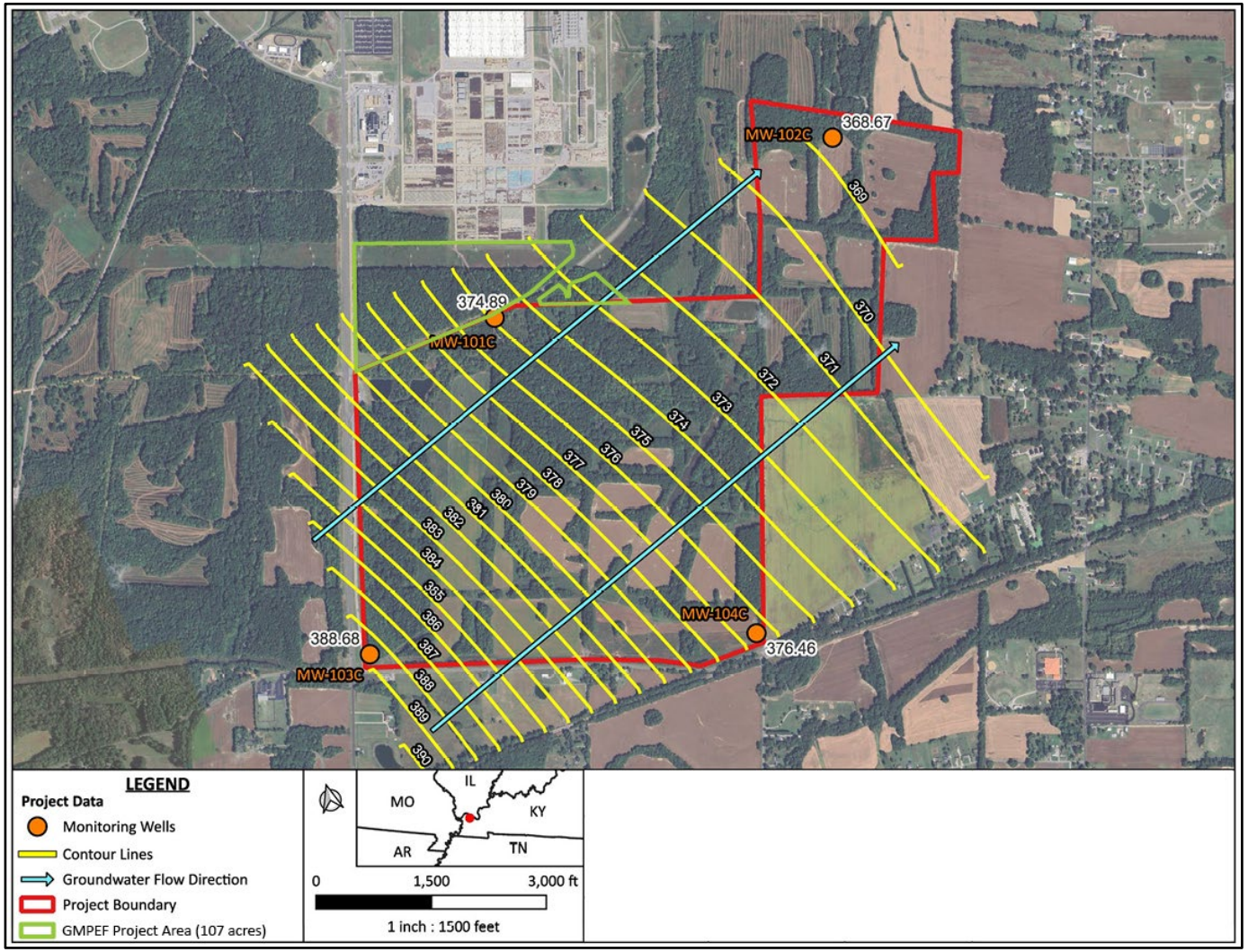
The surficial aquifer (unconsolidated) refers to the shallowest aquifer in the region. At, and south of, the PLEF Site, undifferentiated Quaternary alluvium deposits comprise the shallowest aquifer (GLE, 2025). The subsurface investigation at the PLEF Site found that these deposits are primarily composed of silts and clays with fine to coarse sand and some gravels. This was confirmed during a recent onsite geotechnical exploration, where the general stratigraphy of the GMPEF Site consisted of a layer of surficial loess composed primarily of silt, but also containing clay and fine sand particles (BFW Engineering & Consulting, Inc., 2026a).

Water levels collected in the surficial aquifer during the PLEF subsurface investigation indicate that groundwater flows to the northeast (Figure 3-15). Water levels collected in the surficial aquifer between December 2024 and March 2025 indicate a generally consistent northeast trend. Elevations and calculated hydraulic parameters are summarized in the Supplemental Assessment of Hydrogeologic Conditions, which can be found in Appendix H of the PLEF ER (GLE, 2025). Based on information in the PLEF ER and information from monitoring performed at the DOE Paducah Site (DOE, 2024b), groundwater flow would be expected to be similar beneath the GMPEF Site.

Table 3-7: PLEF and GMPEF Site Hydrogeologic Units

Era	System	Series	Group	Formation	Thickness (feet)	Character	Water-Bearing Characteristics	
Cenozoic	Quaternary	Recent		Alluvium	0–100	Clay, silt, sand, gravel, stream deposited.	Yields moderate amounts of water to wells; water generally hard, with high iron content; dissolved solids relatively high.	Water Bearer Formations
		Pleistocene		Loess	0–15	Silt, gray to buff; scattered chert and quartz pebbles.	Yields little or no water; increases runoff in many areas.	
	Tertiary	Pliocene		Gravel	0–50	Gravel, subangular chert pebbles with a few pebbles of quartzite and limestone. Sand matrix iron stained and cemented in part.	Furnishes moderate amounts of water to rural wells. Iron generally low; hardness and dissolved solids low to moderately high.	
		Eocene	Claiborne	Holly Springs sand	0–150	Sand, fine- to coarse-grained, rounded to subrounded quartz; lenses of plastic clay; iron indurated beds at the contacts of the sand and clay.	Yields as much as several hundred gallons per minute. Hardness and dissolved solids generally low; iron. low to high.	
		Paleocene	Midway	Porters Creek clay	0–200	Clay, very fine textured, light- to dark-gray; interbedded, fine, silty micaceous sands.	Acts as barrier to hold up water in overlying aquifers; sandy beds may yield some water to dug wells.	
Mesozoic	Cretaceous	Upper Cretaceous		Ripley formation	0–250	Sand, brown to gray, very fine- to medium-grained; interbedded medium- to dark brown micaceous clays.	Yields as much as several hundred gallons per minute. Water generally high in iron content; soft to moderately hard.	

Sources: (GLE, 2025; Pree et al., 1957)
Key: GMPEF = General Matter Paducah Enrichment Facility; PLEF = Paducah Laser Enrichment Facility



Source: GLE (2025)

Figure 3-15: PLEF Site Piezometric Surface Elevations Unconsolidated Formation

3.4.1.2.2 Confining Layer

The Porters Creek Clay is composed of fat clay with very little sand and gravel inclusions and is notably less permeable than overlaying surficial and underlaying McNairy aquifers. At some boring locations advanced onsite sand content observed increases near the base of the Porters Creek clay where the contact was observed to range from sharp to gradational, as reported in boring logs collected from investigations at the PLEF Site (GLE, 2025). As a result, the Porters Creek clay acts as a confining layer between the overlying sediment and the underlying McNairy aquifers (Davis et al., 1973; NRC, 2026). Preliminary findings collected during a subsurface investigation of the PLEF Site indicated the Porters Creek clay was encountered from 30 feet bgs with a thickness of approximately 127 feet on the north side of the site. Near the southern boundary of the GLE Site, the Porters Creek clay was encountered at approximately 133 feet with a thickness of approximately 121 feet. The Porters Creek clay thickens from south to north, just below the GLE Site, before thinning as the formation approaches the Ohio River (GLE, 2025).

A potentiometric surface map for the GLE Site was created from water elevations collected in the monitoring wells (Figure 3-16). Although water was encountered in the Porters Creek clay, the Porters Creek clay is considered an aquitard with very low hydraulic conductivity.

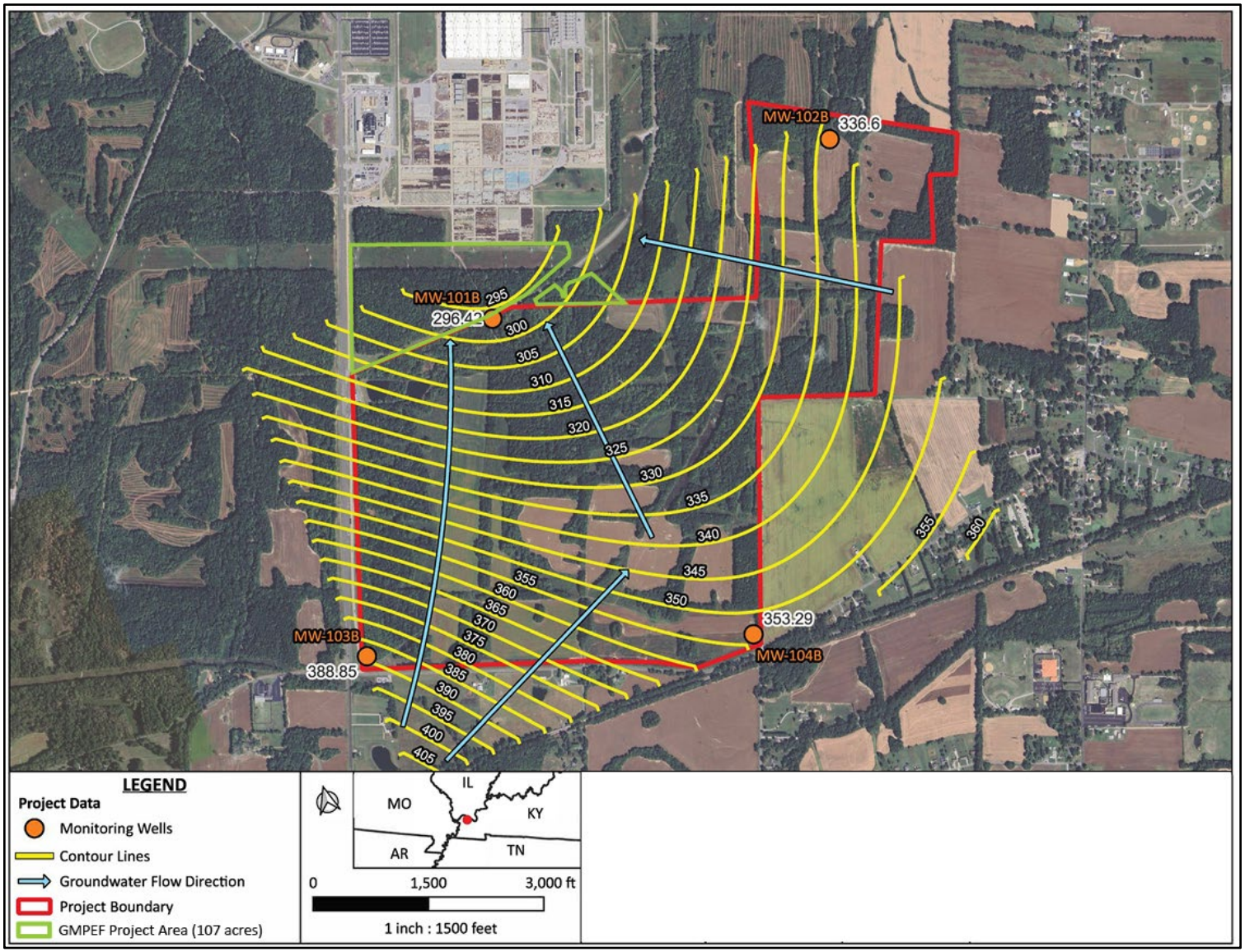
3.4.1.2.3 Principal Aquifer

At the PLEF Site, the principal aquifer refers to the upper part of the McNairy Formation, which is composed of fine to medium sand and some "weakly indurated" sandstone with some clay, silt, gravel, and discontinuous coal seams (Nelson, 1998; Martin et al., 2007; NRC, 2026). Though the coarse sand at the base of the McNairy is considered the best for high water yield (exceeding 1,000 gallons per minute), groundwater was anticipated to be encountered within the upper portion of the McNairy Formation near the Porters Creek clay contact (GLE, 2025; Davis et al., 1973). Monitoring wells with screen intervals targeting the upper 20 feet of McNairy Formation were installed to characterize this zone and water levels collected during the subsurface investigation at the PLEF Site indicate that groundwater flow in the McNairy flows to the north northwest (Figure 3-17). Elevations and calculated hydraulic parameters are summarized in Appendix H of the PLEF ER (GLE, 2025). Based on information in the PLEF ER and information from monitoring performed at the DOE Paducah Site (DOE, 2024b) groundwater flow would be expected to be similar beneath the GMPEF Site.

3.4.1.3 *Preexisting Groundwater Impacts*

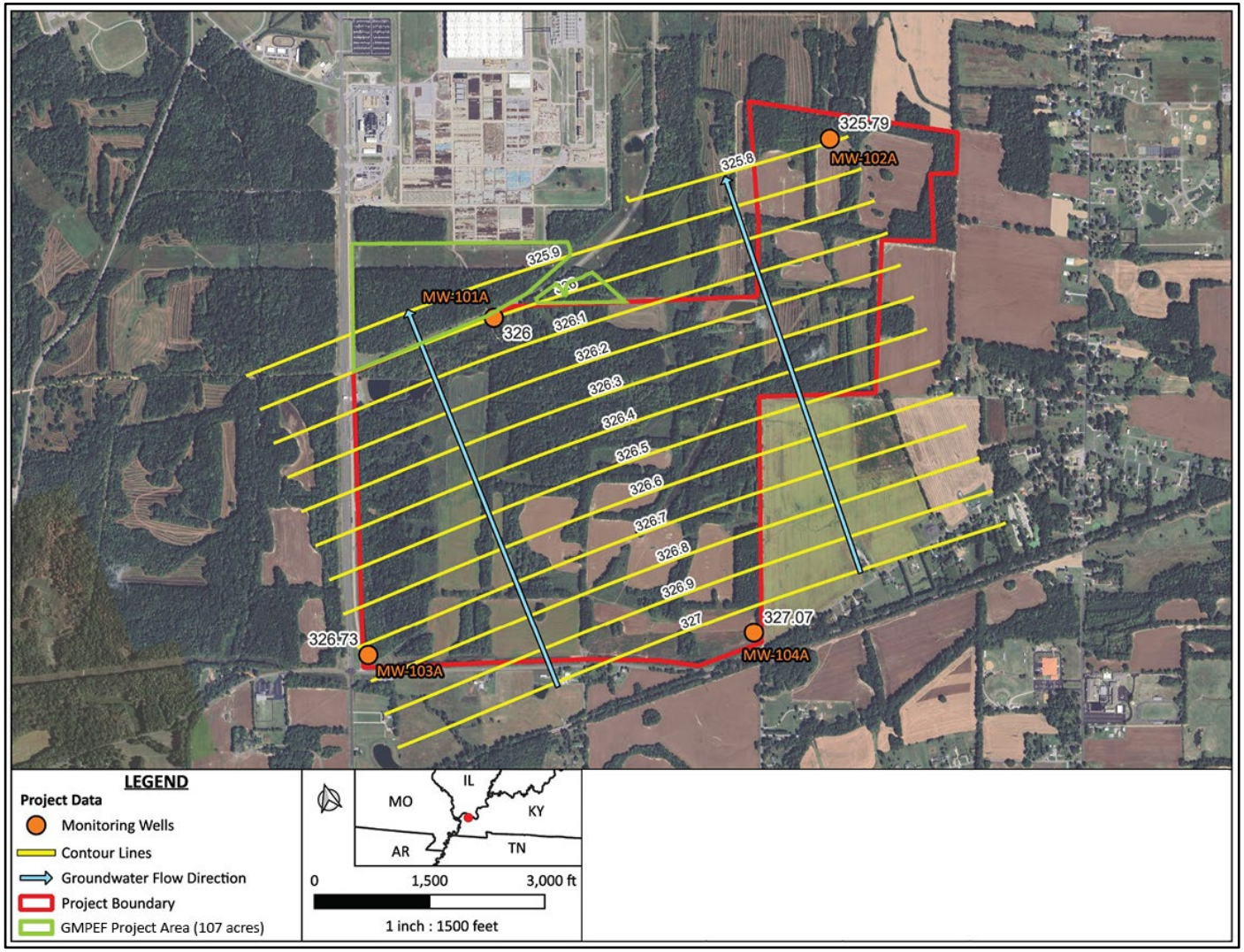
3.4.1.3.1 Area Groundwater Impacts

An environmental records search using *The EDR Radius Atlas* was conducted for the PLEF ER for locations with known or potential environmental issues within a radius of 1 mile of the PLEF Site (GLE, 2025). The search includes Federal data sources, such as the national priority list and Resource Conservation and Recovery Act treatment, storage, and disposal facilities; State data sources, such as leaking underground storage tanks and voluntary cleanup sites; and other data sources. Sites listed in the search may have known environmental impacts, or they may be associated with operations with the potential for impacts (e.g., storage of hazardous substances). Five records were found within the 1-mile radius, all of which were related to the DOE Paducah Site.



Source: GLE (2025)

Figure 3-16: PLEF Site Piezometric Surface Elevations Porters Creek Formation



Source: GLE (2025)

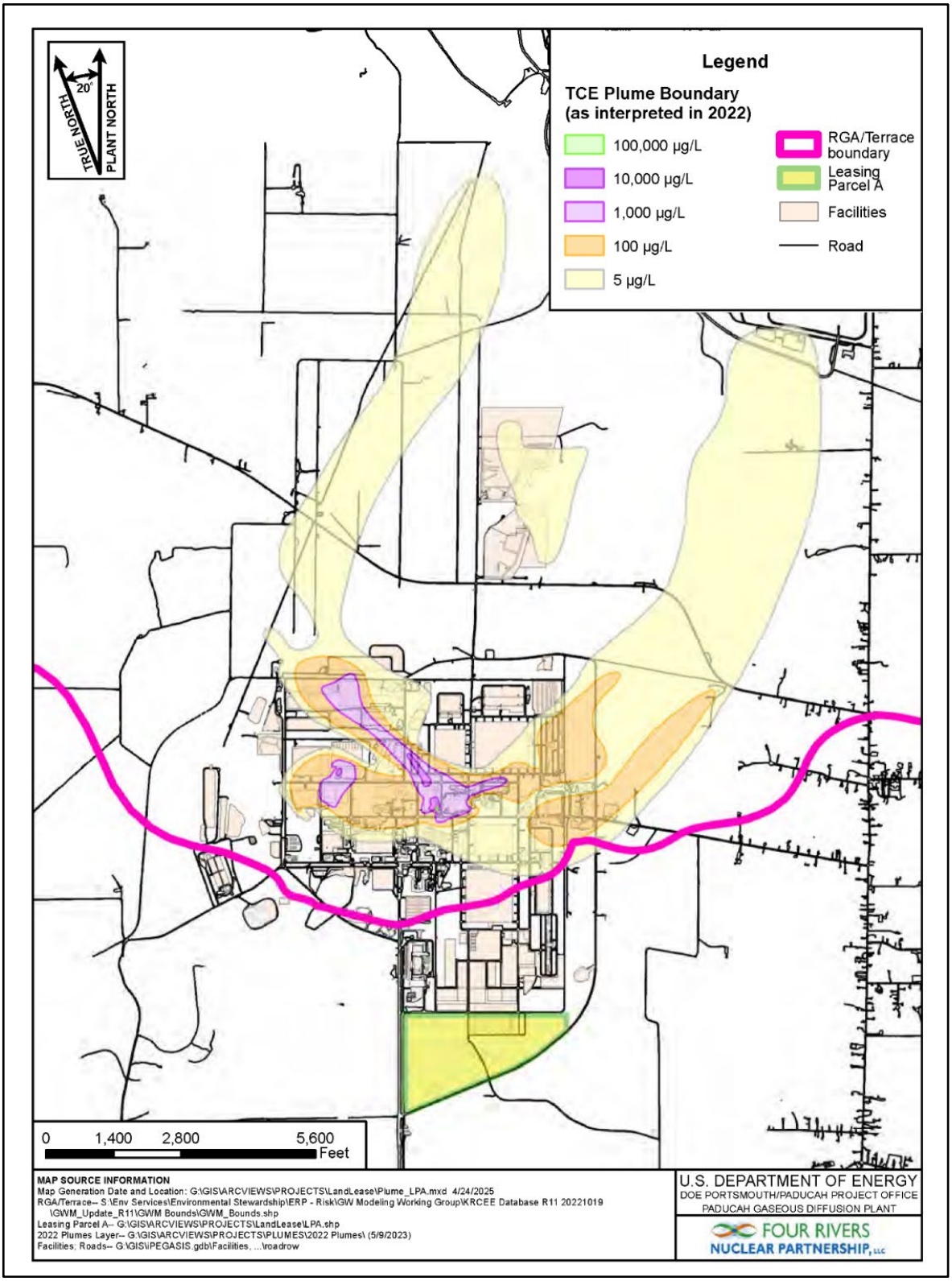
Figure 3-17: PLEF Site Piezometric Surface Elevations McNairy Formation

DOE and EPA Region 4 entered into an Administrative Consent Order in August 1988 under Sections 104 and 106 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, commonly known as "Superfund") in response to offsite groundwater contamination detected at PGDP in July 1988. The results of the Paducah Site (PGDP) Investigation (Phase 1) in 1991 determined the primary offsite contaminants in the Regional Gravel aquifer, which is the primary aquifer for local groundwater users, were trichloroethene (TCE) and technetium-99 (Tc-99). TCE was used until 1993 as an industrial degreasing solvent, and Tc-99 is a fission byproduct contained in nuclear power reactor returns that were brought on site through 1976 for the re-enrichment of uranium-235. Known or potential sources of TCE and Tc-99 include former test areas, spills, leaks, buried waste, and leachate from contaminated scrap metal previously stored on site. On May 31, 1994, the PGDP Site was placed on the EPA National Priorities List, which includes sites across the Nation designated by the EPA as the highest priority for remediation (DOE, 2025e; GLE, 2025).

Historically, groundwater in the Regional Gravel Aquifer (RGA) was the primary source of drinking water for residents and businesses in the vicinity of the Paducah Site. DOE implemented a CERCLA non-time critical removal action known as the Water Policy for areas where the groundwater either is known to be contaminated or has the potential to become contaminated. While Parcel A is within the Water Policy Boundary, it overlies the Terrace Gravel flow system rather than the RGA; therefore, the contamination present in the RGA does not underlie Parcel A. Within the Water Policy area, DOE has provided water hookups to the municipal water supply and pays water bills for affected residences and businesses. An educational mailer has been mailed to residents annually since 2016 to ensure public awareness of the groundwater contamination. Residential wells have been capped and locked per license agreements between DOE and residents (renewed every 5 years). Additionally, potential exposure to contaminated groundwater will be further minimized through a lease restriction of groundwater use. The Paducah Site uses surface water from the Ohio River for potable water (DOE, 2025a; Mill Creek, 2025).

As described in the PLEF ER (GLE, 2025), a total of 254 monitoring wells and residential wells were sampled in accordance with DOE orders and Federal and State requirements during 2022. Monitoring wells sampled in 2022 and the estimated extent of TCE plumes associated with the Paducah Site are shown on Figure 3-18. Concentrations of primary contaminants of concern detected in the groundwater plumes at Paducah continued to decrease in 2024. A groundwater strategy initiative that collects information on sources and levels of contamination in groundwater was continued from previous years. This information will lead to a better understanding of the extent of groundwater contamination and how this contamination is receding (DOE, 2025a).

Because of the legacy operation of the PGDP, the region surrounding the Paducah Site is also extensively monitored by the Kentucky Department of Environmental Protection Division of Waste Management, Radiation Health Branch (RHB) under the DOE's Federal Facility Agreement (FFA) and Agreement in Principle (AIP) grants (GLE, 2025). The Kentucky Department for Environmental Protection Laboratory and the Cabinet for Health and Family Services' RHB laboratory analyzes groundwater samples as well as air and surface water samples for gross alpha and gross beta concentrations and gamma spectroscopy. If trigger levels for gross alpha and/or gross beta are exceeded, then the Cabinet for Health and Family Services will further analyze the sample for isotopic radionuclides (GLE, 2025; Commonwealth of Kentucky, 2023).



Source: DOE (2025a)

Figure 3-18: Location of Terrace Gravel and Regional Gravel Aquifer Boundary and TCE Plume in Relation to the GMPEF Site

3.4.1.3.2 Area Groundwater Quality

3.4.1.3.2.1 Radiological Monitoring

The RHB monitors groundwater by routinely collecting quarterly samples at 10 residential wells surrounding the GMPEF Site. Each sample is analyzed for gross alpha/beta counting and gamma spectroscopy. If gross alpha equals or exceeds 5 pCi/L and/or gross beta equals or exceeds 9 pCi/L, then Tc-99 is also analyzed. The 2024 results of DOE groundwater monitoring for radionuclides are shown in Table 3-8 (DOE, 2025e; GLE, 2025).

Table 3-8: Ranges of Detected Analytes in DOE Monitoring Well Groundwater Samples

Radionuclides	Concentration (pCi/L)
Alpha activity	5.43–11.5
Beta activity	3.74–869
Radium-226	0.771–1.85
Radium-228	3.85–7.41
Technetium-99	11.9–51,000
Thorium-230	1.92–4.21
Uranium-235	0.000264–0.0133
Uranium-238	0.0313–2.07

Sources: (DOE, 2025e; GLE, 2025)
Key: DOE = United States Department of Energy; pCi/L = picocuries per liter

The majority of the locations where samples are taken are private drinking water wells that are potentially impacted by the TCE and Tc-99 plumes travelling off the Paducah Site. These wells are no longer used for drinking water, however, RHB continually evaluates the results from this sampling activity, along with results from third-party activities and activities at the PGDP, to determine the need for additional monitoring locations or modification of monitoring at current locations.

3.4.1.3.2.2 Non-Radiological Monitoring

During 2022, AIP staff collected 139 samples from 74 monitoring wells and 15 samples from 15 residential wells. These monitoring wells and seep sampling locations and residential well sampling locations were primarily north, northwest, and northeast of the PGDP. Most of the wells sampled were located within 2 miles of PGDP groundwater plumes and/or less than 2 miles from the PGDP property boundary. Kentucky AIP environmental sampling results provide a line of evidence that supports validation of DOE data collection procedures and confirms that DOE analytical laboratory results are accurate, reproducible, and independently verifiable. The AIP Program's independent oversight of the DOE's groundwater sampling program also helps establish the accuracy of analytical results used to construct contaminant plume maps (Commonwealth of Kentucky, 2023).

3.4.1.3.3 GMPEF Site Groundwater Impacts

Groundwater samples at the adjacent PLEF Site were collected at each screened interval and analyzed for volatile organic compounds (VOCs), semi-VOCs, total metals, and other water quality parameters. Detections of arsenic, lead, chromium, and methylene chloride above their respective EPA Maximum Contaminant Levels were reported (GLE, 2025).

Groundwater wells to be installed on the GMPEF Site will be periodically monitored for water quality as described in Chapter 6.0, *Environmental Measurements and Monitoring Programs*.

3.4.1.3.4 GMPEF Site Groundwater Remediation

GMPEF does not propose to use groundwater as a water supply and would not discharge untreated wastewater to groundwater. In addition, the lease for the GMPEF property includes a prohibition on groundwater extraction (DOE, 2025a). The prohibition states:

- Leasehold will include limitations that prohibit groundwater extraction and use by the lessee.
- Groundwater underlying the Leasehold shall not be extracted, consumed, exposed, or utilized for any purpose, potable or otherwise, or permitted to be extracted, consumed, exposed, or utilized for the same; however, the lessee may install (or cause to be installed) groundwater wells necessary or appropriate to complete its environmental site assessment, to advance project development (including obtaining permits), and project operation (including obtaining permits, for monitoring, and for any dewatering during shallow excavation and construction activities or subsurface utility installation or repair).
- Groundwater supply wells shall not be installed or utilized on any part of the Leasehold, nor shall the lessee undertake activities that materially adversely affect the subsurface flow direction, velocity, and other comparable hydrogeological characteristics of such groundwater beyond that contemplated for the construction and operation of the lessee's facility, including Leasehold retention pond construction, facility stability, and dewatering.
- DOE shall retain all rights of access and ownership to Leasing Parcel A necessary to conduct remedial action.

Under the terms of the lease, DOE would be responsible for remediation of any preexisting contamination if it became necessary.

3.4.2 Surface Waters

3.4.2.1 *Streams, Lakes, and Impoundments*

3.4.2.1.1 Streams

The GMPEF Project Area is located in the Ohio River Basin, which covers approximately 204,000 square miles and drains into the Mississippi River (USACE, 2025a; NRC, 2026). The Paducah Site is in the western portion of the Ohio River drainage basin, which is approximately 15 miles downstream of the confluence of the Ohio River with the Tennessee River and approximately 35 miles upstream of the confluence of the Ohio River with the Mississippi River (DOE, 2025a).

The GMPEF Site is located within the Bayou Creek-Ohio River watershed Hydraulic Unit Code 051402060701 (GLE, 2025; EPA, 2025b). Streams within the watershed near the GMPEF Site include Little Bayou Creek and Bayou Creek. Little Bayou Creek (Kentucky State Waterbody Identifier [ID] KY 1098) flows to the east of the GMPEF Site and is the nearest named waterbody. Little Bayou Creek is approximately 7.9 miles long and has a drainage basin of approximately 5.78 square miles (GLE, 2025; USGS, 2010a). Little Bayou Creek combines with Bayou Creek before entering the Ohio River.

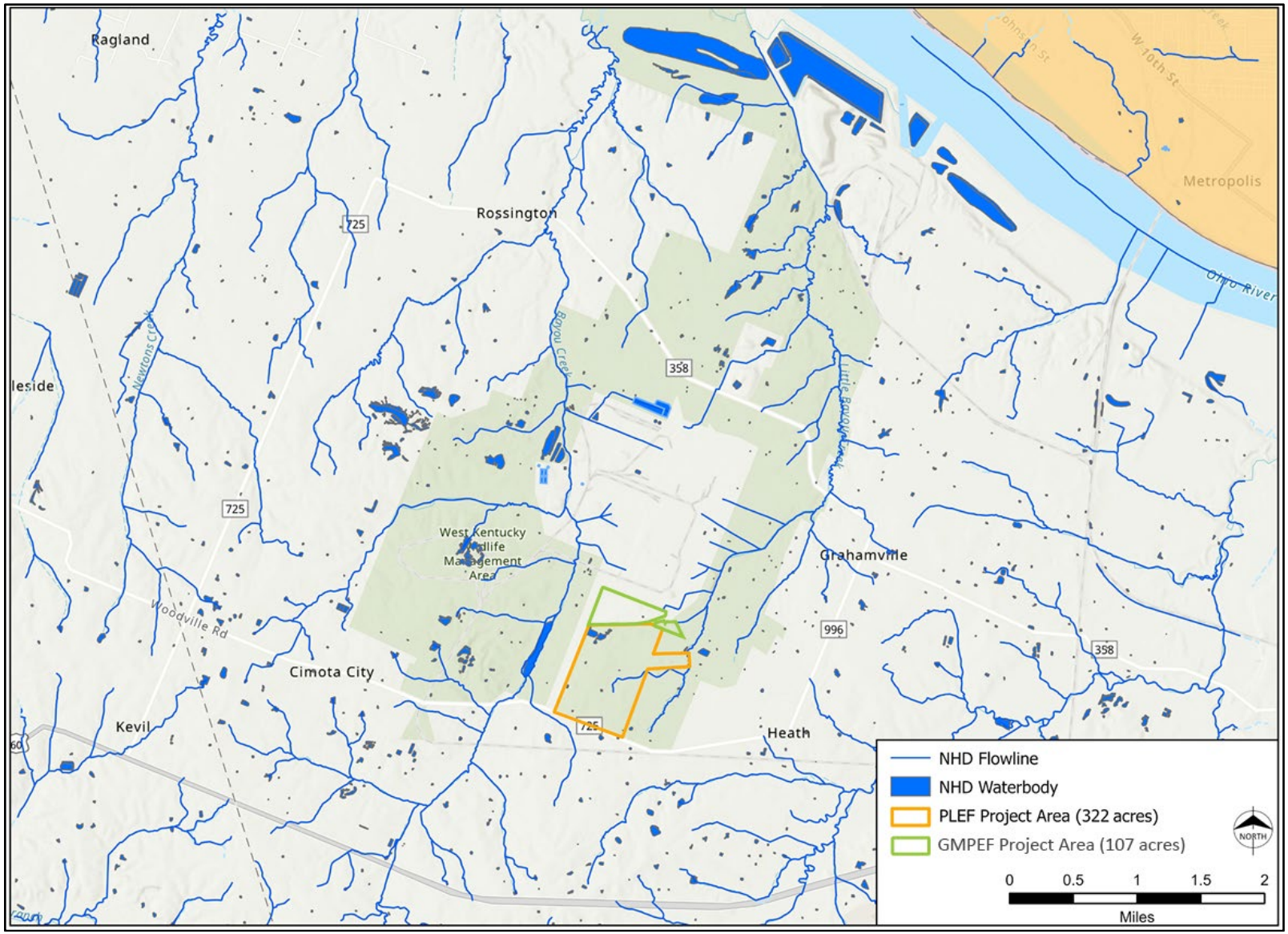
Little Bayou Creek originates just east of, and outside of, the GMPEF Site. Locally, this creek is sometimes called Four Mile Creek (GLE, 2025; Mapcarta, 2025); however, the name is not officially recognized by any Federal or State regulatory agency. The lower reaches of Little Bayou Creek are within the flood plain of the Ohio River (GLE, 2025; EPA, 2025b). The median stream flow for Little Bayou Creek, collected by the USGS between 1991 and 2010 from streamflow gage 03611900, is 1.2 cubic feet per second (GLE, 2025; USGS, 2010a). The USGS gage is no longer active and was located upstream of the DOE Paducah Site discharges. During the dry season, which extends from summer to early fall, the upper section of Little Bayou Creek may exhibit no-flow conditions. Throughout this time, the Paducah Site may account for 100 percent of flow in Little Bayou Creek (GLE, 2025; DOE, 2011).

The GMPEF Site is situated on the watershed divide between Bayou Creek and Little Bayou Creek. Surface flow is east-northeast toward Little Bayou Creek and west-northwest toward Bayou Creek. Locally, the eastern part of Parcel A is within the drainage area of Little Bayou Creek while the western portion of the parcel drains to Bayou Creek (DOE, 2025a). The proposed switchyard area (Parcel C) also lies within the drainage area of Little Bayou Creek. The Kentucky Energy and Environment Cabinet (KEEC) classifies the surface waters of Little Bayou Creek and Bayou Creek as impaired.

Bayou Creek (Kentucky State Waterbody ID KY 187) originates to the west of Hobbs Road, and outside of, the GMPEF Site. Bayou Creek is approximately 12.6 miles long and has a drainage basin of approximately 6.55 square miles (GLE, 2025; USGS, 2010b). The median stream flow for Bayou Creek, collected by the USGS between 1990 and 2010 from streamflow gage 03611800, is 0.33 cubic feet per second. The streamflow gage is upstream of the GMPEF Site. Bayou Creek enters the Ohio River north of the Paducah Site. Figure 3-19 depicts streams and other surface waters encompassed by and adjacent to the GMPEF Site.

The lowest flow for a 7-day period on a rotating 10-year basis (7Q10 flow), was not identified for Bayou Creek and Little Bayou Creek at the USGS gages. However, the fact sheet for PGDP's Kentucky Pollutant Discharge Elimination System (KPDES) permit indicates the 7Q10 low flow for both streams is 0 cubic feet per second (GLE, 2025; KDEP, 2022a).

Little Bayou Creek, Bayou Creek, and several local stormwater ditches facilitate drainage at the GMPEF Site. Current stormwater drainage (including rainfall and snow melt) from the GMPEF Site flows east via unnamed tributaries to Little Bayou Creek; to the west to Hobbs Road, where it flows north through a series of culverts, one of which transports the stormwater to the western side of Hobbs Road and into Bayou Creek. Therefore, runoff from GMPEF construction may impact Bayou Creek and Little Bayou Creek. Figure 3-19 shows the current GMPEF Site surface water drainage.



Source: GLE (2025)

Figure 3-19: Area Surface Waters

3.4.2.1.2 Lakes and Impoundments

There are no ponds, lakes, or surface water impoundments at the GMPEF Site. There are two existing ponds in the northwestern corner of the GLE Site, southeast of the Hobbs Road and Dyke Road intersection. The WKWMA collectively identified these ponds as 3 Lane Pond (GLE, 2025; KDFWR, 2022). The ponds are not identified on the EPA's How's My Waterway website and not assigned a Kentucky State Waterbody ID. The ponds capture surface water from the northwestern portion of the PLEF Site.

Metropolis Lake (Kentucky Waterbody ID Y-1274) is located northeast of the GMPEF Site within the Bayou Creek-Ohio River Watershed, near the banks of the Ohio River. The lake encompasses 37 acres (GLE, 2025; EPA, 2025c). Because Metropolis Lake is east of Little Bayou Creek, it is not likely to receive any drainage from the GMPEF.

3.4.2.2 *Surface Water Quality Characteristics*

As outlined in 40 CFR Part 130, water quality standards are mandated by the Clean Water Act (CWA). Water quality standards define "the water quality goals of a water body, or portion thereof, by designating the use or uses to be made of the water and by setting criteria necessary to protect the uses" (40 CFR 130.3). The EPA delegated the requirement to establish water quality standards to the Kentucky Division of Water (KDOW) for surface waters in Kentucky. Little Bayou Creek is designated as warm water aquatic habitat, fish consumption, drinking water, swimming, and boating. It was assessed for warm water aquatic habitat and fish consumption in 2009 and was consequently listed as not supporting warm water aquatic habitat due to copper, lead, polychlorinated biphenyls (PCBs), and unknown contamination (GLE, 2025; KDOW, 2022a). This assessment also lists Little Bayou Creek as not supporting fish consumption due to PCB contamination. The data used for these classifications was collected from 1988 to 2008 for the warm water aquatic habitat classification and from 1988 to 2001 for the fish consumption classification. A total maximum daily load (TMDL), which led to the implementation of a fish consumption advisory, identified the Paducah Site as the source of PCBs (downstream of the GMPEF Site, the Paducah Site is authorized to discharge into Little Bayou Creek through KPDES Permit KY0004049). Ongoing remediation at the Paducah Site is expected to lower PCBs in Little Bayou Creek and its sediments. Sampling shows reaches of Little Bayou Creek near the GLE Site were non-detect for PCBs (GLE, 2025; KDOW, 2001).

Bayou Creek is designated as warm water aquatic habitat, fish consumption, domestic water supply, primary contact recreation, and secondary contact recreation. Bayou Creek was assessed for warm water aquatic habitat in 2021 and was consequently listed as not supporting for warm water aquatic habitat. This is due to copper, lead, mercury contamination, sedimentation/siltation, and eutrophication (GLE, 2025; KDOW, 2022b). Sources that have led to this classification include industrial point source discharge, illegal dumping, inappropriate waste disposal, non-irrigated crop production, and habitat modification. An assessment for fish consumption, conducted in 2009, lists Bayou Creek as fully supported (GLE, 2025; KDOW, 2022b).

3.4.2.3 *General Water Quality Monitoring Data*

DOE and independent entities monitor surface waters for radiological parameters and nonradiological parameters at multiple locations near the GMPEF Site, as described in the following sections.

3.4.2.3.1 Radiological Monitoring

RHB AIP monitors surface water by taking quarterly samples at 28 locations surrounding the Paducah Site and through continuous sampling at an additional four locations. Note: sampling locations are labeled "ISCO" due to the brand name of the samplers that are used. ISCO samples are collected and composited over 21-day periods and gross alpha/beta analysis and isotope-specific analyses are performed on the samples.

The locations for surface water monitoring were selected based on outfalls from the Paducah Site, locations of known runoff from contaminated areas, and historical sampling locations. The background locations are located upstream in Bayou Creek (ISCO B and BBCUG), upstream in Little Bayou Creek (LBCUG), upstream of the C-746-K Landfill (UPC746K), and approximately 5 miles to the southeast on Massac Creek (a known unimpacted local waterway).

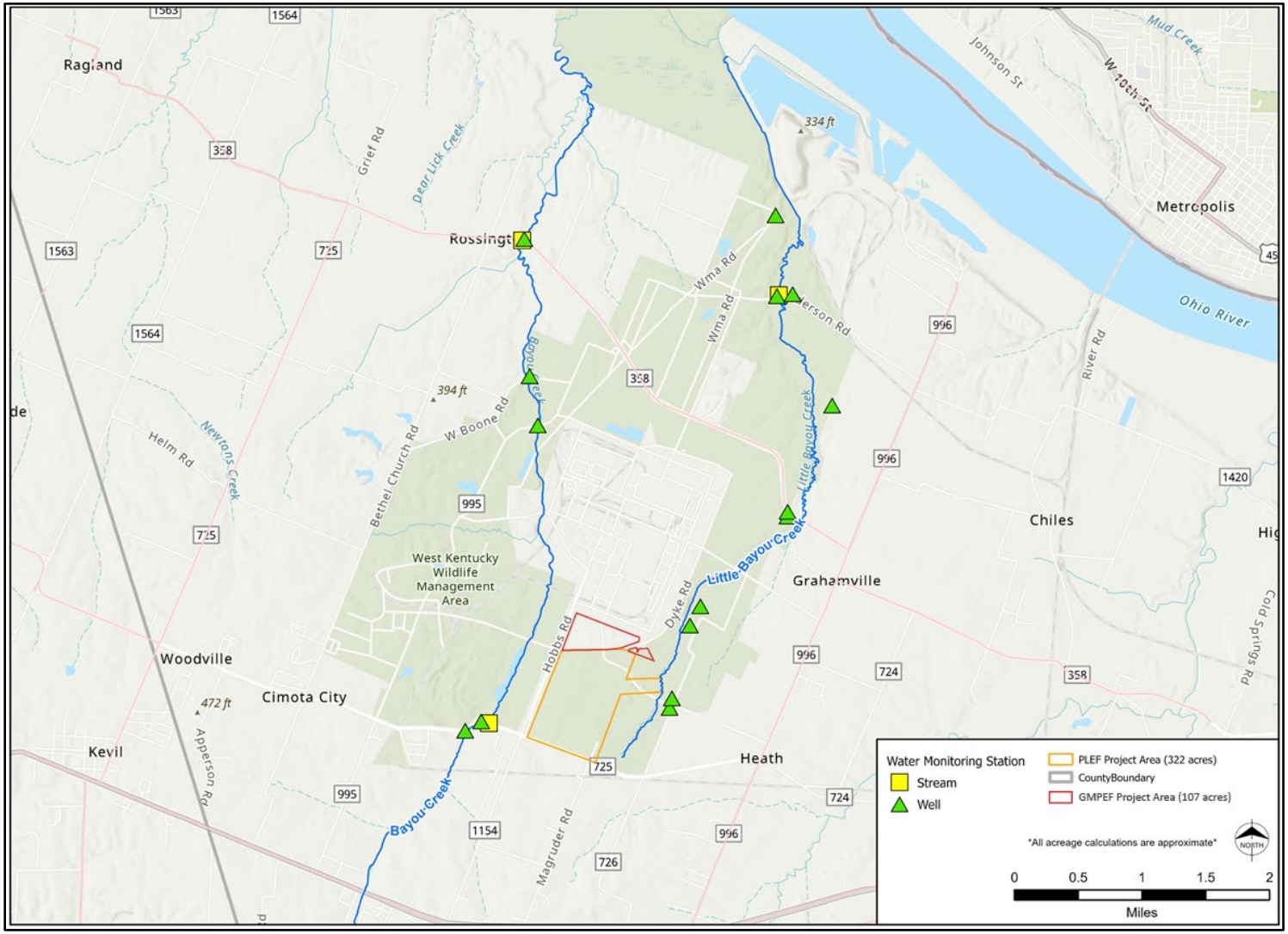
In 2013, elevated levels of uranium were found leaving the C-746-U solid waste landfill in surface water. The source of the contamination was determined to be from recently removed C340 paneling that had high levels of surface contamination by a mobile uranium compound (likely uranyl fluoride). In response, RHB AIP began monitoring points in the discharge path from C-746-U, beginning in August 2013, to ensure that effluent release limits were not exceeded. These levels have naturally decreased with time and are currently well below the effluent release limits. During the fourth quarter of 2015, DOE implemented treatment on C746-U discharges, significantly lowering the levels of contamination. Monitoring will continue; however, future results are expected to be comparable to background levels at current landfill inventory (GLE, 2025).

In 2022, there were no abnormal measurements from samples collected at RHB AIP surface water monitoring locations (GLE, 2025; Commonwealth of Kentucky, 2023). DOE also conducts surface water monitoring as shown on Figure 3-20. The maximum detected radionuclides in surface water samples for 2022 are shown in Table 3-9. Monitoring results reported for 2024 were similar in the most recent Paducah Site Annual Site Environmental Report 2024 (DOE, 2025e).

Table 3-9: Maximum Detected Radionuclides in DOE Surface Water Samples

Radionuclides	Concentration (pCi/L)
Tc-99	3.67E+01
Uranium-234	2.18E+01
Uranium-235	4.12E+00
Uranium-238	1.61E+02

Sources: (DOE, 2025e; GLE, 2025)
Key: DOE = United States Department of Energy; pCi/L = picocuries per liter; Tc-99 = technetium-99



Source: GLE (2025)

Figure 3-20: Water Quality Monitoring Locations Along Bayou Creek and Little Bayou Creek

3.4.2.3.2 Nonradiological Monitoring

There is no ongoing water quality monitoring of Bayou Creek or Little Bayou Creek by regulatory agencies. Little Bayou Creek was monitored for stream flow, temperature, and specific conductance between 1990 and 1995 by the USGS at gage 03611900, although this monitoring program has since been discontinued (GLE, 2025; USGS, 2010a). Similarly, Bayou Creek was monitored for stream flow, temperature, and specific conductance between 1990 and 1995 by the USGS at gage 03611850 downstream of the PGDP and gage 03611800 upstream of the PGDP (GLE, 2025; USGS, 2010a). See "stream" sampling locations on Figure 3-20.

Little Bayou Creek was sampled in 2008 by the University of Kentucky to assess surface water metals in anticipation of a TMDL development for warm water aquatic habitat (GLE, 2025; University of Kentucky, 2010). No TMDL for these analytes has yet been issued. This program included one location on Little Bayou Creek, east of the GMPEF Site, which was sampled 19 times between August 2007 and March 2008. The metals that were tested for were copper, lead, iron, and mercury. A summary of the results at this monitoring station is provided below:

- Copper was detected in 16 of the 19 samples collected. Of these 16 samples, the average concentration was 0.0106 milligrams per liter (mg/L). The maximum concentration was 0.110 mg/L with a detection limit of 0.002 mg/L.
- Lead was detected in 4 of the 19 samples collected. Of these four samples, the average concentration was 0.004 mg/L. The maximum concentration was 0.008 mg/L with a detection limit of 0.002 mg/L.
- Iron was detected in all 19 samples, but 1 of the samples was determined to be an outlier. The average iron concentration was 1.013 mg/L. The maximum concentration was 2.63 mg/L with a detection limit of 0.02 mg/L.
- Mercury was not detected in any of the samples. The detection limit for mercury was 0.0002 mg/L.

PCB sampling collected between 1992 and 1996 identified six sites in Little Bayou Creek near Paducah Site outfalls with concentrations over 1.0 parts per million (ppm). As a result, a TMDL and a fish consumption advisory were issued (GLE, 2025; KDOW, 2001).

The DOE Paducah Site is permitted to discharge from seven outfalls into Little Bayou Creek and from eight outfalls into Bayou Creek under its KPDES permit (GLE, 2025; KDEP, 2022a). DOE routinely monitors surface water at the Paducah Site. Ranges of this and other detected analytes in surface water are summarized in Table 3-10.

Table 3-10: Ranges of Analytes in DOE Surface Water Samples

Analyte	Range (µg/L)
Anions	
Chloride	519–36,900
Sulfate	2,630-54,300
Water Chemistry Parameters	
Biochemical Oxygen Demand	2,670–24,600
Chemical Oxygen Demand	13,200–113,000
Dissolved Solids	81,000–322,000
Hardness – total as $CaCO_3$	26,600–238,000
Nonsettleable Solids	14,400–18,800
Settleable Solids	2,500–231,000
Suspended Solids	600–276,000
Total Organic Carbon	4,040–27,800

Table 3-10: Ranges of Analytes in DOE Surface Water Samples

Analyte	Range (µg/L)
Total Solids	109,000–550,000
Volatile Organic Compounds	
TCE	0.39–0.61
PCBs	
PCB-1248	0.0461–0.0807
PCB-1254	0.0365–0.0383
PCB-1260	0.0709–0.528
Total PCBs	0.0365–0.528
Other Organics	
Oil and grease	1,350–3,300
Metals	
Aluminum	60–522
Barium	40.7–64.5
Calcium	12,100–29,200
Copper	0.941–3.49
Iron	97.7–21,500
Lead	0.617–0.922
Magnesium	2,740–5,610
Manganese	22.6–266
Mercury	0.00664–0.0467
Nickel	0.671–1.56
Phosphorus	22–1,370
Potassium	3,210–9,160
Sodium	759–27,300
Uranium	0.163–470
Zinc	12.2–147

Sources: (DOE, 2025e; GLE, 2025)
Key: $CaCO_3$ = calcium carbonate; DOE = United States Department of Energy; PCB = polychlorinated biphenyl; TCE = trichloroethene; µg/L = micrograms per liter

Groundwater seeps flow into Little Bayou Creek downstream of the Paducah Site (GLE, 2025; Commonwealth of Kentucky, 2023). The Commonwealth of Kentucky samples these seeps to monitor TCE that may be upwelling from the groundwater and flowing into Little Bayou Creek. Of the six seeps that were sampled, TCE concentrations ranged from non-detect to 1.05 micrograms per liter (GLE, 2025; Commonwealth of Kentucky, 2023).

Nonradiological parameters monitored by the Paducah Site vary by outfalls. These parameters consist of temperature, pH, total suspended solids, oil, grease, copper, zinc, chlorine, PCBs, TCE, and phosphorus. These outfalls are downstream of the GMPEF Site, and the sampling locations are not directly on Little Bayou Creek (GLE, 2025; KDEP, 2022a).

Two other KPDES permits issued to nearby facilities also required discharge monitoring. Magruder Village Water Corp (KPDES number KY0083577) discharges only sanitary wastewater to Bayou Creek upstream of the GMPEF Site (GLE, 2025; KDEP, 2024). The Shawnee Fossil Plant, a coal-fired power plant, (KPDES number KY0004219), (GLE, 2025; KDEP, 2022b) discharges to Little Bayou Creek downstream from the GMPEF Site and the DOE Paducah Site. Discharges include Noncontact Cooling Water, Non-Process Waters, and Stormwater. Neither of these facilities perform instreams water sampling. See Figure 3-21 for locations of existing KPDES permittees.

3.4.2.4 *Pre-Existing Environmental Conditions*

Due to rough grading activities, the surface hydrology of the GMPEF Site has been altered recently. However, there are no flowing surface water bodies on the GMPEF Site except stormwater that flows during and after precipitation events. As discussed in Section 3.4.2.1, *Streams, Lakes, and Impoundments*, surface water runoff from the GMPEF Site discharges into Little Bayou Creek to the east, or Bayou Creek to the west. None of these waterbodies are currently monitored by the KDOW, EPA, nor the USGS. Per the KDOW, Little Bayou Creek is rated as non-support for warm water aquatic habitat or fish consumption (GLE, 2025; KDOW, 2022a; NRC, 2026) based on data collected between 1988 and 2008. Warm water aquatic habitat is non-supported due to copper, lead, PCBs, and other unknown causes. Fish consumption is not supported due to polychlorinated biphenyl contamination in fish tissue. The suspected sources for these contaminants are illegal dumping or other inappropriate waste disposal and industrial point source discharges. Bayou Creek is rated as non-support for warm water aquatic habitat and full support for fish consumption (KDOW, 2022b; NRC, 2026). This is based upon historical sampling data on the creek.

3.4.2.5 *Historical and Current Hydrologic Data from Non-Related Projects*

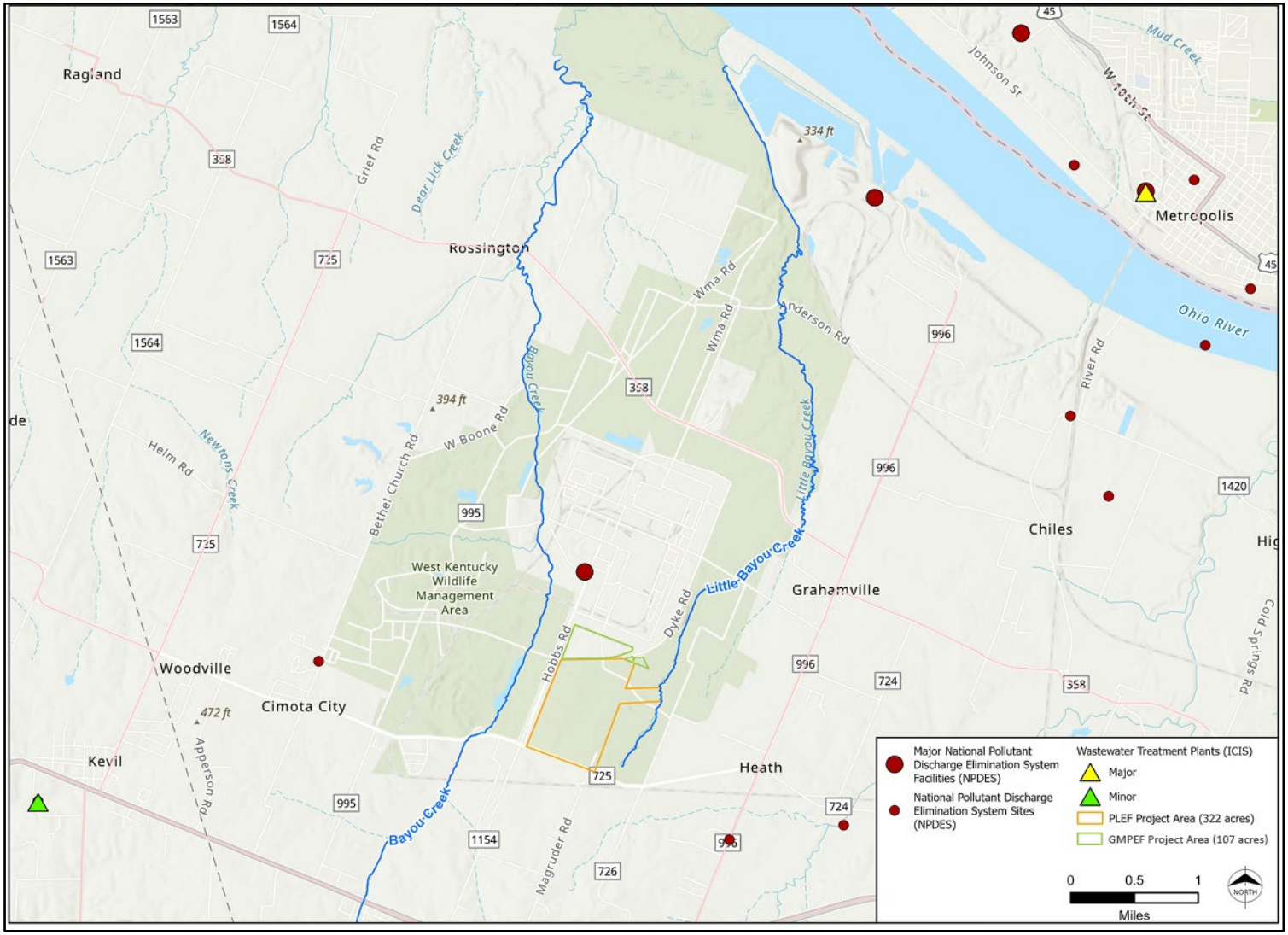
There are no reservoirs or dams currently existing in the Bayou Creek-Ohio River watershed and there are no proposals for a new dam or other hydrologic projects in the area. Local drinking water and industrial process water is supplied by private groundwater wells and Paducah Water Works, a municipally owned water utility that uses surface water from the Ohio River as its primary source but is also permitted to use groundwater (GLE, 2025; EPA, 2025d; EPA, 2025e) (see Section 3.4.5, *Water Use*).

3.4.2.6 *Surface Water Rights and Resources*

Kentucky water laws are based on the "riparian rights" concept, rather than appropriated water rights. Appropriated water rights refer to the "first in time, first in right" allocation system used primarily in the Western United States. Kentucky legal precedent set in the mid-1900s established a riparian landowner's rights "to the enjoyment of a stream of running water in its natural state in flow, quantity, and quality" but further noted this was "on the condition that his use is reasonable and does not unreasonably interfere with a neighboring riparian's right" (GLE, 2025; Ausness & Flynn, 1975) This approach has been promulgated at the Kentucky Revised Statutes 151.140, which requires entities withdrawing public water for use to secure a permit (GLE, 2025).

3.4.2.7 *Quantitative Description of Surface Water Use*

No surface water uses (e.g., withdrawals, consumptions) are planned for the GMPEF Site. All water used at the GMPEF Site would be provided by the DOE Paducah Site or Paducah Water Works, a municipally owned water treatment and distribution utility. Additional information on water use is provided in Section 3.4.5, *Water Use*.



Source: GLE (2025)

Figure 3-21: National Pollutant Discharge Elimination System Permittees Near the PLEF and GMPEF Sites

3.4.2.8 *Non-Consumptive Surface Water Use*

Within the Bayou Creek-Ohio River watershed, Bayou Creek, Little Bayou Creek, and the Ohio River are all designated for use as drinking water, aquatic life, fish and shellfish consumption, swimming, and boating. Some segments of the Ohio River are also designated for aesthetic quality in Illinois (State Waterbody ID: IL_A-920-981) and Outstanding State Resource Water in Kentucky (State Waterbody ID: KY 3471, KY 3473, and KY 3475). Bayou Creek and Little Bayou Creek are not used directly as drinking water sources but are categorized as such due to their draining to the Ohio River (see Table 3-11). The Ohio River is also used for navigational and recreational purposes. Recreational purposes include boating, swimming, fishing, and wildlife observation.

Table 3-11: Nearby Drinking Water Systems

Drinking Water Withdrawal System/Public Water System ID	Water Type Used	Watershed
PGDP (permitted as Four Rivers Nuclear Partnership, LLC) / KY0732457	Surface Water	Bayou Creek–Ohio River (HUC 051402060701)
City of Kevil, Kentucky / KY0040223	Ground Water	Upper Humphrey Creek (HUC 051402060601)
Paducah Water Works / KY0730533	Ground and Surface Waters	Surface Water: Mud Creek–Ohio River (HUC 051402060102) Ground Water: from within the Dunn Slough Creek – Clarks River watershed (HUC 060400060405)
City of Metropolis, Illinois / IL1270150	Ground and Surface Waters	Bayou Creek–Ohio River (HUC 051402060701) (north side of Ohio River)
Honeywell International Inc. / IL3042127	Ground Water	Bayou Creek–Ohio River (HUC 051402060701) / (north side of Ohio River)
City of Joppa, Illinois / IL1270100	Ground Water	Bayou Creek–Ohio River (HUC 051402060701) / (north side of Ohio River)

Sources: (GLE, 2025; EPA, 2025b; EPA, 2025c; EPA, 2025d; EPA, 2025e; EPA, 2025f; EPA, 2025g)
Key: HUC = Hydrologic Unit Code; ID = Identifier; IL = Illinois; KY = Kentucky; LLC = Limited Liability Company; PGDP = Paducah Gaseous Diffusion Plant

3.4.2.9 *Pollutant Sources*

3.4.2.9.1 Point Sources

Downstream of the GMPEF Site, the DOE Paducah Site discharges from seven outfalls into Little Bayou Creek under KPDES permit KY0004049. The outfalls permitted to discharge into Little Bayou Creek are identified as outfall numbers 002, 010, 011, 012, 013, 019, and 020. This discharge primarily consists of cooling water and stormwater, with outfall 020 also discharging landfill leachate. These outfalls discharge an average of 5.652 million gallons per day into Little Bayou Creek (GLE, 2025; KDEP, 2022a). Since a major portion of these discharges consists of stormwater, the flow from these outfalls is storm dependent. Monitoring efforts to maintain compliance with the KPDES permit includes effluent water quality sampling. Samples are required to be taken from each of these outfalls monthly and must be representative of the volume and nature of the monitored discharge.

The DOE Paducah Site also discharges from eight outfalls into Bayou Creek under KPDES permit KY0004049. These outfalls are identified in the permit as outfalls 001, 004, 006, 008, 009, 015, 016, and

017 and consist of process water, non-process water, cooling water, sanitary wastewater, landfill leachate, laboratory/miscellaneous water, and stormwater. These outfalls discharge an average of 5.501 million gallons per day into Bayou Creek (GLE, 2025; KDEP, 2022a). Monitoring efforts to maintain compliance with the KPDES permit includes effluent water quality sampling. Samples are required to be taken from each of these outfalls monthly and must be representative of the volume and nature of the monitored discharge. As of July 28, 2026, there have been four formal enforcement actions taken upon the PGDP identified in the EPA's Enforcement and Compliance History Online database within the previous 10 years. These formal enforcement actions totaled in a combined fee of $35,000 and occurred October 2015, May 2020, April 2024, and August 2025 (EPA, 2026a).

Per the EPA, there are 18 permitted dischargers in addition to the DOE Paducah Site in the Bayou Creek–Ohio River watershed. Of these 18 permitted discharges, only the DOE Paducah Site discharges into Little Bayou Creek. KPDES Permittees near the GMPEF Site are depicted on Figure 3-21. A summary of the three KPDES facilities that discharge into Little Bayou Creek or Bayou Creek is presented in Table 3-12. Other permitted facilities discharge to other waterbodies in the watershed as shown on Figure 3-21.

Table 3-12: KPDES Permitted Facilities that Discharge to Little Bayou Creek or Bayou Creek

Permit	Owner	Facility	Type	Class
KY0004049	Four Rivers Nuclear Partnership, LLC	PGDP	Industrial Individual Permit	Major
KYR10P59	Kentucky Department of Transportation	KOW Wire Burn Area	Construction Stormwater	Minor
KY0083577	Magruder Village Water Company	Magruder Village Water Corporation	Industrial Individual Permit	Minor

Source: (GLE, 2025)
Key: KOW = Kentucky Ordnance Works; KPDES = Kentucky Pollutant Discharge Elimination System; LLC = Limited Liability Company; PGDP = Paducah Gaseous Diffusion Plant

3.4.2.9.2 Non-Point Sources

The GMPEF Site does not have any stormwater permits since no industrial activities requiring stormwater management are currently performed on site. However, under implementation of the Proposed Action, stormwater from the construction of the GMPEF could flow west to Bayou Creek and east to Little Bayou Creek resulting in the need for a KPDES stormwater construction permit. As such, the GMPEF Site has applied for a KPDES Construction Stormwater General Permit (KY10) through the KDOW Department for Environmental Protection. This general permit authorizes the discharge of pollutants in stormwater discharges associated with both small and large construction activities. Under the permit requirements, a Storm Water Pollution Prevention Plan must be developed to minimize potential pollutants from contact with stormwater and include best management practices regarding stormwater management. In addition, the permit would require the GMPEF to inspect stormwater infrastructure on site and monitor stormwater runoff from the site.

During operations, a KPDES permit would be required for stormwater discharge associated with industrial activities. Details regarding the effluent characteristics and potential stormwater outfall locations for the Proposed Action are discussed in Section 4.13, *Waste Management Impacts* and Section 4.5, *Water Resource Impacts*, respectively.

3.4.2.9.3 Federal and State Regulations

The CWA requires regulation of discharges into "Waters of the United States" (WOTUS). The EPA is the principal administrative agency of the CWA; however, responsibility for certain sections of the CWA falls under the purview of other agencies. This section discusses various CWA sections.

3.4.2.9.4 Waters of the United States

Section 404 of the CWA authorizes the U.S. Army Corps of Engineers (USACE) to issue permits for the discharge of dredged or fill material into WOTUS, including wetlands. The USACE regulatory program is defined in 33 CFR Parts 320–330. Before an activity occurs, applicable permits must be obtained, and any compensatory mitigation must be determined. If USACE determines that a Section 404 permit is required because a proposed project involves impacts to wetlands or WOTUS, then a Section 401 Water Quality Certification (WQC) is also required. USACE also determines which type of permit (i.e., Nationwide, Regional, General, or Individual permit) is applicable to a project.

Section 401 of the CWA delegates authority to the states to issue a 401 WQC for all projects that require a Federal permit (such as a CWA Section 404 Permit). The Section 401 WQC is essentially verification by the State that a given project will not degrade State waters or otherwise violate water quality standards.

The Ohio River is a navigable water of the United States, defined as "those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible to use to transport interstate or foreign commerce" (33 CFR Part 329, Definition of Navigable Waters of the United States). Both a Section 404 permit and Section 401 WQC are required for impacts to surface waters that are considered either a traditional navigable water or a tributary to traditional navigable water. Little Bayou Creek is a tributary of the Ohio River, and any impact to this stream would require a Section 404 permit and a Section 401 WQC.

Under Section 10 of the Rivers and Harbors Act of 1899, the building of wharfs, piers, and other structures is prohibited without approval, and excavation or fill within navigable waters requires approval of USACE.

3.4.2.9.5 National Pollutant Discharge Elimination System

The EPA created the NPDES to track and control point sources of pollution in accordance with the CWA. The primary method of control is issuing permits to dischargers with limitations on wastewater flow and constituents. The EPA delegated permitting authority to the State of Kentucky in 1983 (GLE, 2025). Kentucky's program, KPDES, may establish limits for flow (i.e., quantity discharged), conventional pollutants (e.g., total organic carbon, biochemical oxygen demand, bromide, pH, total suspended solids, oil, and grease), conservative pollutants (e.g., metals), and non-conservative pollutants (e.g., VOCs) (KDEP, 2016) where needed to protect surface waters.

The Proposed Action would require KPDES permits to be obtained to allow discharge of stormwater and any treated process wastewater. Details regarding the effluent characteristics and potential stormwater outfall locations for the Proposed Action are discussed in Section 4.13, Waste Management Impacts, and Section 4.5, Water Resource Impacts, respectively.

3.4.2.10 *Site-Specific Surface Water Characteristics*

General surface water characteristics are discussed in Section 3.4.2.1.1 for streams and rivers and Section 3.4.2.1.2 for lakes and impoundments. Information on the floodplain and its relationship to the GMPEF Site, including flood frequency distribution and flood control measures, is discussed in Section 3.4.3. Surface waters at the GMPEF Site are shown on Figure 3-19.

3.4.2.10.1 Streams

No streams flow within the GMPEF Site. Drainage from the GMPEF Site flows to Little Bayou Creek to the east and Bayou Creek to the west. The GMPEF Site surface water drainage is illustrated on Figure 3-19. Based on the topography of the site, approximately half of the GMPEF Project Site drains to Little Bayou Creek and approximately half drains to Bayou Creek.

3.4.2.10.2 Outfalls

There are currently no facilities at the GMPEF Site except for the existing cylinder storage pad. The existing cylinder storage pad discharges stormwater to the DOE Paducah Site stormwater management system. Effluents from the DOE Paducah Site stormwater management system are discharged to outfalls on Little Bayou Creek and Bayou Creek.

3.4.2.11 *Hydrologic Data*

See Section 3.4.2.1, *Streams, Lakes, and Impoundments*, for a discussion of hydrologic data for Bayou Creek and Little Bayou Creek.

Since the GMPEF Site is located near the headwaters of Bayou Creek and Little Bayou Creek, there are no major facilities located upstream of the site that would have impactful diurnal releases causing short duration flow fluctuations. Downstream of the GMPEF Site, the PGDP contributes up to 100 percent of the Little Bayou Creek flow. Rainfall, snowmelt, and a series of dams, regulate the flow of the Ohio River.

3.4.2.12 *Lakes and Impoundments*

There are no permanent surface water bodies on site (including lakes and impoundments) and no cooling water or water supply reservoirs proposed for the GMPEF. Information on existing lakes and impoundments on the GMPEF Site is discussed in Section 3.4.2.1, *Streams, Lakes, and Impoundments*.

3.4.2.13 *Estuaries and Oceans*

There are no estuaries or oceans within the GMPEF Project Area.

3.4.3 Floodplains

3.4.3.1 *Floodplain Distribution*

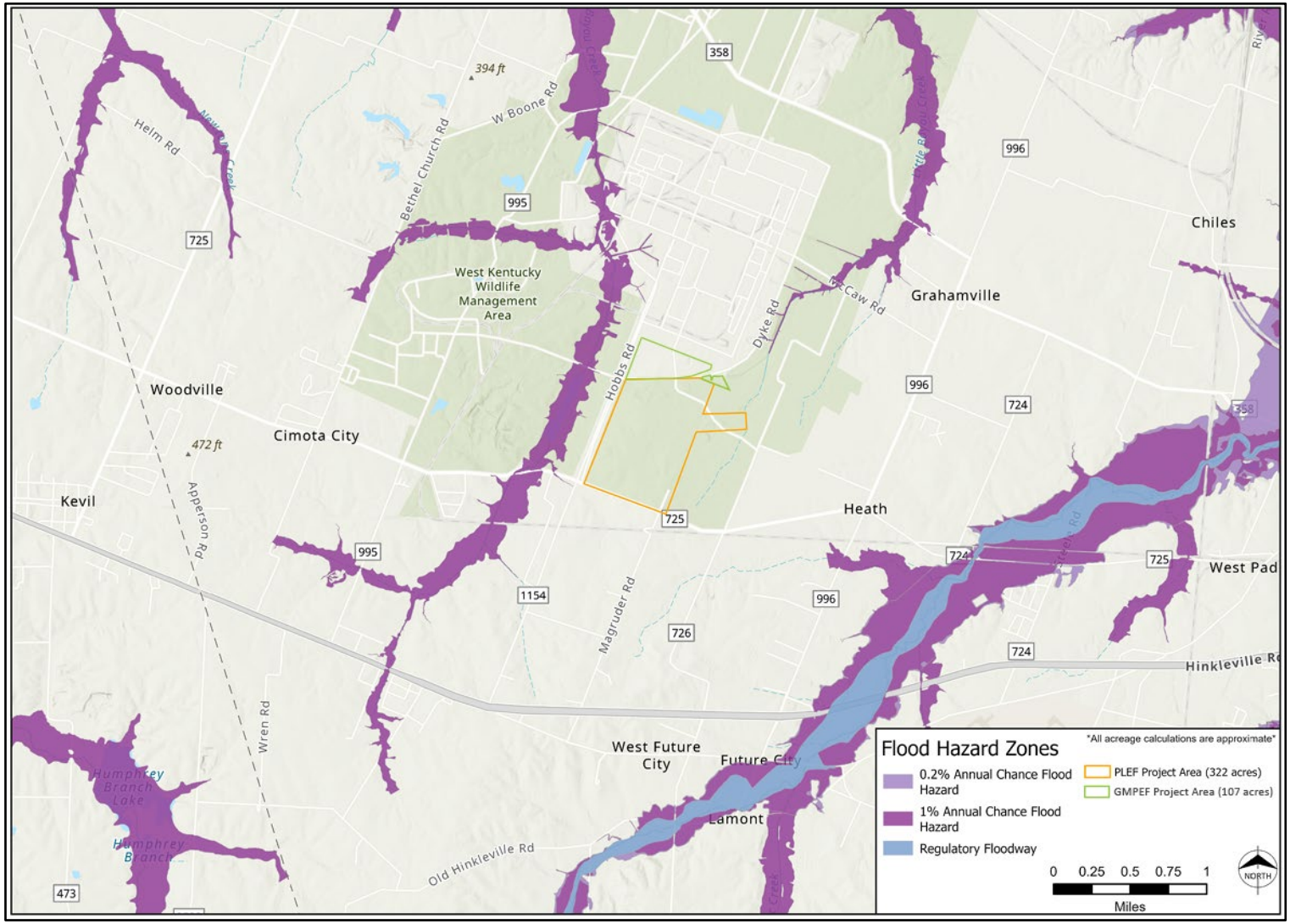
The primary sources of flooding in McCracken County are from the Ohio River and its tributaries. The GMPEF Site (Parcel A) is flanked by two of these tributaries, Bayou Creek and Little Bayou Creek (the proposed switchyard area within Parcel C is bordered by Little Bayou Creek only). The extents of their flood boundaries can be seen on Figure 3-22, showing that the flood hazard zones associated with these waterways do not extend into the GMPEF Site. Flood Insurance Rate Maps 21145C0105F and 21145C0110F show these hazard zones over the larger general areas. The flood hazard zone delineated on these maps are designated as "Zone A," which is a 1-percent-annual chance floodplain (100 year) determined by approximate methods as stated in the *2011 Flood Insurance Study (FIS): A Report of Flood Hazard Areas in McCracken County, Kentucky, and Incorporated Areas* (GLE, 2025; FEMA, 2011).

3.4.3.2 *Flood-Control Measures*

Based on the 2011 Flood Insurance Study for McCracken County (FEMA, 2011), flood control measures are not needed for the GMPEF Site since the site is not located in a flood hazard zone. However, there are numerous flood protection measures on the Ohio River and in the vicinity of Paducah, several miles east of the GMPEF Site.

3.4.3.3 *Regulatory Issues*

For sites impacting the flood hazard zone, a floodplain development permit is required by the McCracken County Inspection Department prior to construction. The GMPEF Site (Parcel A and the proposed switchyard area within Parcel C) is not located in a Federal Emergency Management Agency flood hazard zone therefore it will not require a floodplain development permit for construction.



Source: GLE (2025)

Figure 3-22: Flood Hazard Zones for Bayou Creek and Little Bayou Creek

3.4.4 Wetlands

Wetlands present within the 100-acre GMPEF Site were not considered WOTUS under the jurisdiction of USACE. The ditches, erosional gullies, and/or vegetated swales observed did not exhibit defined bed and banks, ordinary high-water marks, or other salient characteristics of jurisdictional waters (CEC, 2025a). On December 19, 2025, USACE granted an Approved Jurisdictional Determination for the site and officially concurred with the "no permit required" determination, thus satisfying compliance with Section 404 of CWA and Section 10 of the Rivers and Harbors Act (USACE, 2025b). GeM obtained this determination prior to beginning rough grading activities within Parcel A.

Subsequently, the 6.8-acre area located within Parcel C was identified for use as a potential switchyard facility. As such, an additional waters delineation survey was conducted in July of 2026 to identify potential WOTUS features within the proposed switchyard area. Preliminary results of the delineation identified approximately 3.71 acres of wetland habitat (CEC, 2026a). Refer to Section 3.5.4, *Wetlands*, for additional information.

3.4.5 Water Use

3.4.5.1 *Regional Water Use*

Four entities use surface water and/or groundwater as a drinking water source in the Bayou Creek – Ohio River Watershed, although none collect water from within the footprint of the GMPEF Site (see Table 3-11). Paducah Water Works, a potential water source for the GMPEF Site, primarily uses Ohio River surface water for its source water but is also permitted to withdraw groundwater from within the Dunn Slough Creek – Clarks River watershed (HUC 060400060405), approximately 15 miles east of GMPEF Site. (GLE, 2025; EPA, 2025d; EPA, 2025e). The Source Water Assessment and Protection Program area for the Paducah Water Works system is located nearby but not within the GMPEF Site.

Table 3-13 shows water usage information for the region surrounding the GMPEF Site within Ballard and McCracken Counties. Surface water and groundwater are used by public water supply, industry, agriculture, and irrigation.

Table 3-13: Water Use in McCracken and Ballard Counties

Type of Water Use	McCracken County	Ballard County
Total Population of area, in thousands	65.018	8.212
Public supply total population served, in thousands	61.312	4.541
Public supply self-supplied groundwater withdrawals, fresh, in MGD	0	0.58
Public supply self-supplied surface-water withdrawals, fresh, in MGD	8.21	0
Public supply deliveries to domestic, in MGD	4.29	0.32
Public supply per capita use, in gallons/person/day	134	128
Domestic self-supplied groundwater withdrawals, fresh, in MGD	0.19	0.18
Domestic self-supplied population, in thousands	3.706	3.671
Domestic deliveries from public supply, in MGD	4.29	0.32
Domestic per capita use, public-supplied, in gallons/person/day	70	70
Domestic per capita use, self-supplied, in gallons/person/day	51	49
Industrial self-supplied groundwater withdrawals, fresh, in MGD	0.34	2.75
Industrial self-supplied surface-water withdrawals, fresh, in MGD	4.08	21.8
Industrial total self-supplied withdrawals, fresh, in MGD	4.42	24.55
Total thermoelectric power self-supplied surface-water withdrawals, fresh, in MGD	903.21	0
Mining total self-supplied withdrawals, in MGD	0	0
Livestock self-supplied groundwater withdrawals, fresh, in MGD	0.01	0.01

Table 3-13: Water Use in McCracken and Ballard Counties

Type of Water Use	McCracken County	Ballard County
Livestock self-supplied surface-water withdrawals, fresh, in MGD	0.05	0.2
Aquaculture total self-supplied withdrawals, groundwater, in MGD	0	0
Irrigation, total self-supplied withdrawals, groundwater, in MGD	0.06	0.01
Irrigation, total self-supplied surface-water withdrawals, fresh, in MGD	0.12	0.18
Irrigation, total self-supplied withdrawals, fresh, in MGD	0.18	0.19
Irrigation, total self-supplied withdrawals, in MGD	0.18	0.19
Irrigation, total consumptive use, fresh, in MGD	0.17	0.17
Irrigation, crop self-supplied groundwater withdrawals for crops, fresh, in MGD	0	0.01
Irrigation, crop self-supplied surface-water withdrawals for crops, fresh, in MGD	0.12	0.18
Irrigation, crop total self-supplied withdrawals for crops, fresh, in MGD	0.12	0.19
Irrigation, golf courses self-supplied groundwater withdrawals for golf courses, fresh, in MGD	0.06	0

Sources: (GLE, 2025; USGS, 2015)
Key: MGD = million gallons per day

3.4.5.2 *Site Water Use*

Because there are no facilities at the GMPEF Site, there is currently no water use. Potable water for the GMPEF Site is planned to be provided by the DOE Paducah Site or Paducah Water Works. There is an existing 10-inch water main located approximately 3,000 feet east of the intersection of Hobbs and Woodville Road, near Magruder Road (GLE, 2025). There are also water main lines located within the DOE Paducah Site as part of the PGDP water distribution system.

3.4.5.3 *Regulatory Framework*

Because the GMPEF will obtain site water supply from a water supplier, there are no regulatory requirements to be complied with for water consumption.

3.5 Ecological Resources

Ecological resources include the plant and animal species, habitats, and ecological relationships of the land and water areas within GMPEF Site, which is defined as the area directly or indirectly affected by the Proposed Action described in Chapter 1.0, *Introduction*. Particular consideration is given to special status species, which are those species protected under Federal or State law, including threatened and endangered species, migratory birds, and bald and golden eagles. For the purposes of this ER, special status species include plant and animal species that are federally listed (United States Fish and Wildlife Service [USFWS]) or State-listed (Kentucky Department of Fish and Wildlife Resources [KDFWR]) for protection. Identifying which species occur in an area affected by an action may be accomplished through literature reviews and coordination with appropriate Federal and State regulatory agency representatives, resource managers, and other knowledgeable experts.

The following section provides an overview of the GMPEF Site's current ecological baseline environment summarized from existing documentation and field studies conducted July 28–30, 2025. For a detailed description and analysis of the terrestrial and aquatic communities within direct proximity of the GMPEF Project Area, refer to Section 2.5 of the 2023 *Paducah Gaseous Diffusion Plant Paducah Site Annual Site Environmental Report* (DOE, 2024b) and Section 3.5, *Ecological Resources*, within the PLEF (NRC, 2026).

3.5.1 Vegetation

The GMPEF Site is located within the EPA's Level IV Ecoregion 74b: The Loess Plains, a productive agricultural area consisting of gently rolling uplands, broad bottomlands, and terraces. Natural vegetation is typically composed of oak-hickory forest and bluestem prairie (EPA, 2024). Grasslands and forested wetlands once widespread have largely been replaced by cropland and mixed agriculture. Historically, vegetation of this region consisted of bottomland deciduous forest woodland abundant in green ash (*Fraxinus pennsylvanica*) and Carolina ash (*Fraxinus caroliniana*), elm species (*Ulmus* sp.), eastern cottonwood (*Populus deltoides*), sugarberry (*Celtis laevigata*), sweet-gum (*Liquidambar styraciflua*), water tupelo (*Nyssa aquatica*), oak species (*Quercus* sp.), and bald cypress (*Taxodium distichum*) (Bailey, 1995). The GMPEF Project Area was converted to agricultural land sometime prior to the 1940s but began regenerating to forested woodland around the 1970s (DOE, 2015b).

Currently, the GMPEF Site includes approximately 100 acres of disturbed land (i.e., recently cleared, rough graded, and maintained transmission line right-of-way [ROW]) and approximately 6.8 acres of mixed-growth forested land located across Dyke Road. Dominant tree species within the forested areas include a combination of pumpkin ash (*Fraxinus profunda*), green ash, red maple (*Acer rubrum*), boxelder (*Acer negundo*), American elm (*Ulmus americana*), American sycamore (*Platanus occidentalis*), oaks (*Quercus* sp.), common hackberry (*Celtis occidentalis*), and shellbark hickory (*Carya laciniosa*) trees. Herbaceous understory includes amur honeysuckle (*Lonicera maackii*), sumac (*Rhus* sp.), Japanese stilt grass (*Microstegium vimineum*), Allegheny blackberry (*Rubus allegheniensis*), false nettle (*Boehmeria*), riverbank grape (*Vitis riparia*), poison ivy (*Toxicodendron radicans*), and coralberry (*Symphoricarpos orbiculatus*).

3.5.2 Fish and Wildlife

Refer to the KDFWR's *State Wildlife Action Plan* for a detailed description of Kentucky's wildlife species and habitats, including a complete listing of the 527 Species of Greatest Conservation Need in the state (KDFWR, 2023).

Wildlife documented in the area includes species indigenous to forests, scrub-shrub, and open grassland communities such as rabbits (*Sylvilagus* sp.), raccoon (*Procyon lotor*), eastern cottontail (*Sylvilagus floridanus*), eastern gray squirrel (*Sciurus carolinensis*), white-tailed deer (*Odocoileus virginianus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), striped skunk (*Mephitis mephitis*), and various small rodents such as bats, mice, voles, and moles. Typical birds of the area include European starling (*Sturnus vulgaris*), cardinal (*Cardinalis cardinalis*), red-winged blackbird (*Agelaius phoeniceus*), mourning dove (*Zenaida macroura*), bobwhite quail (*Colinus virginianus*), turkey (*Meleagris gallopavo*), killdeer (*Charadrius vociferus*), American robin (*Turdus migratorius*), eastern meadowlark (*Sturnella magna*), eastern bluebird (*Sialia sialis*), blue jay (*Cyanocitta cristata*), red-tail hawk (*Buteo jamaicensis*), and great horned owl (*Bubo virginianus*). Reptile and amphibian species that are common to this area include garter snake (*Thamnophis sirtalis*), eastern box turtle (*Terrapene carolina*), common snapping turtle (*Chelydra serpentina*), various frog and toad species (southern leopard frog [*Lithobates sphenocephalus*], gray treefrog [*Dryophytes versicolor*], cricket frog [*Acris crepitans*], American toad [*Anaxyrus americanus*]), eastern fence lizard (*Sceloporus undulatus*), and red-eared slider (*Trachemys scripta elegans*) (DOE, 2024b; DOE, 2025a).

Aquatic habitat within the GMPEF Site are limited to the approximately 3.71 acres of wetland habitat (approximately 3.65 acres of palustrine forested and 0.61 acres palustrine emergent) within the proposed 6.8-acre switchyard area located in Parcel C. Additionally, the KEEC classifies the surface waters of the adjacently located Little Bayou Creek (east) and Bayou Creek (west) as impaired. They are considered to not support warm water aquatic habitat (KEEC 2020).

3.5.3 Special Status Species

3.5.3.1 *Federally Threatened and Endangered Species*

Provisions under Section 7 of the Endangered Species Act (ESA) (16 U.S.C. 1531-1544), as amended, require that any action likely to adversely affect a species classified as federally protected be subject to review by the USFWS. The USFWS Information for Planning and Consultation online system was accessed on August 22, 2025, to request an *Official Species List* to identify federally listed species protected under the ESA with the potential to occur within the GMPEF Site (USFWS, 2025a). Table 3-14 presents these species. There is no federally designated critical habitat on site or within the immediate vicinity of the GMPEF Site (USFWS, 2025a).

Table 3-14: Special Status Species with Potential to Occur Within the GMPEF Project Area

Common Name	Scientific Name	Status		Known Occurrence at PGDP	Suitable Habitat Within the GMPEF Project Area?
		Federal [a]	State [b]		
Mammals					
Gray bat	*Myotis grisescens*	FE	S2	No	No
Indiana bat	*Myotis sodalis*	FE	S1S2	No	Yes
Tricolored bat	*Perimyotis subflavus*	PE	S2	No	Yes
Southeastern myotis	*Myotis austroriparius*	-	SE	No	Yes
Birds					
Whooping crane	*Grus americana*	EXP, MBTA	SNA	No	No
Loggerhead shrike	*Lanius ludovicianus*	MBTA	S3S4	No	Yes
Clams					
Clubshell	*Pleurobema clava*	FE	S1	No	No
Fanshell	*Cyprogenia stegaria*	FE	S1	No	No
Fat pocketbook	*Potamilus capax*	FE	S2	No	No
Longsolid	*Fusconaia subrotunda*	FT	S3	No	No
Orangefoot pimpleback (pearlymussel)	*Plethobasus cooperianus*	FE	S1	No	No
Pink mucket	*Lampsilis abrupta*	FE	S1	No	No
Rabbitsfoot	*Quadrula cylindrica cylindrica*	FT	S2	No	No
Ring pink	*Obovaria retusa*	FE	S1	No	No
Rough pigtoe	*Pleurobema plenum*	FE	S1	No	No
Sheepnose mussel	*Plethobasus cyphyus*	FE	S1	No	No
Spectaclecase	*Cumberlandia monodonta*	FE	S2S3	No	No
Reptiles					
Northern crayfish frog	*Lithobates areolatus circulosus*	-	S3	No	Yes

Table 3-14: Special Status Species with Potential to Occur Within the GMPEF Project Area

Common Name	Scientific Name	Status		Known Occurrence at PGDP	Suitable Habitat Within the GMPEF Project Area?
		Federal [a]	State [b]		
Insects					
Monarch butterfly	*Danaus plexippus*	PT	S4	No	No
Plants					
Cream wild indigo	*Baptisia leucophaea var. leucophaea*	-	S2	No	Yes
Prairie milkweed	*Asclepias hirtella*	-	S2	No	Yes
Rosinweed	*Silphium integrifolium*	-	S3S4	No	Yes
Compassplant	*Silphium laciniatum*	-	S2	No	Yes

Sources*:* (KDFWR, 2023; DOE, 2024b; OKNP, 2025; USFWS, 2025a)
Key*:* FE = federally listed as endangered under the Endangered Species Act; FT = federally listed as threatened under the Endangered Species Act; MBTA = species federally protected under the Migratory Bird Treaty Act; PGDP = Paducah Gaseous Diffusion Plant; S1 = State-listed Critically Imperiled; S2= State-listed Imperiled, S3= State-listed Vulnerable, S4= State-listed Apparently Secure; SNA = State not applicable (not a suitable target for conservation activities, long distance aerial migrants)
Notes:
[a] U.S. Fish and Wildlife Service
[b] Kentucky Department of Fish and Wildlife Resources

None of the 16 federally listed species listed in Table 3-14 have been historically reported as sighted on the DOE Paducah Site, although potential suitable summer habitat previously existed for the federally endangered Indiana bat (*Myotis sodalis*) and proposed endangered tricolored bat (*Perimyotis subflavus*) within the approximately 70 acres of mixed-growth forested areas of the GMPEF Site (DOE, 2024b). As such, targeted species surveys for federally listed bat species were conducted prior to tree clearing activities that took place within the 70-acre forested area within Parcel A (CEC, 2025b). No Federal- or State-listed bat species were captured (CEC, 2025b). Subsequently the 6.8-acre area located within Parcel C was identified for use as a potential switchyard facility. As such, an additional targeted species survey for federally listed bat species was conducted in July of 2026. No Federal- or State-listed bat species were captured (CEC, 2026b). There are no caves within the GMPEF Project Area that would support gray bats (*M. grisescens*).

Suitable habitat for the 11 federally listed mussel species was not found present within any areas of the approximate 107-acre GMPEF Site. Potential suitable habitat may occur in Bayou Creek located directly east and near the mouth of the creek at the Ohio River located about 3.5 miles away.

Neither the monarch butterfly (federally proposed threatened) nor their host plant (milkweed - *Asclepias* sp.) were incidentally observed during the waters delineation survey or during the mist-net survey for Federal- and State-listed bats during surveys in 2025, prior to the rough grading of approximately 100 acres of the 107 acre GMPEF Site (CEC, 2025a; CEC, 2025b; CEC, 2025c). Additionally, neither the monarch butterfly nor its host plant was documented during the habitat assessment, waters delineation survey, or during the mist-net survey for Federal- and State-listed bats during surveys in July of 2026 (CEC, 2026a; CEC, 2026b; CEC, 2026c).

3.5.3.1.1 Migratory Birds

The Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703–712) of 1918 prohibits actions resulting in the pursuit, capture, killing, and/or possession of any protected migratory bird, nest, egg, or parts thereof. Additionally, the 2013 Memorandum of Understanding on Migratory Birds between DOE and the USFWS

regarding Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, direct Federal agencies to take certain actions to further implement the MBTA, which is applicable to the GMPEF Site. DOE takes measures to minimize impacts to migratory birds by avoiding disturbance of active nests.

The USFWS maintains a list of designated migratory birds occurring in various regions of the United States. Birds of Conservation Concern (BCC) are a subset of MBTA-protected species identified by the USFWS as those in the greatest need of additional conservation action to avoid future listing under the ESA. BCC have been identified at three geographic scales: National, USFWS Regions, and Bird Conservation Regions (BCRs). BCRs are the smallest geographic scale at which BCC have been identified, and the lists of BCC species at this scale are expected to be the most useful for governmental agencies to consider in complying with the MBTA and Executive Order 13186 (USFWS, 2021). According to the *USFWS Birds of Conservation Concern* (USFWS, 2021), the GMPEF Site is located within BCR Region 24 – Central Hardwoods, under the Mississippi Flyway North American migration route. The Ohio River also serves as a major flyway for migratory waterfowl (DOE, 2024b).

3.5.3.1.2 Bald and Golden Eagles

The bald eagle (*Haliaeetus leucocephalus*) is protected by the Bald and Golden Eagle Protection Act (16 U.S.C. 668c; 50 CFR 22.3) of 1940 even though it has been delisted under the ESA. Bald eagles can be seen just about anywhere in Kentucky, especially during the migration and winter season (September–March). Occurrences of bald eagles at the GMPEF Site may include over-flights during their spring and fall migrations.

Golden eagles (*Aquila chrysaetos*), also protected under the Bald and Golden Eagle Protection Act, winter in Kentucky from November to March, utilizing large, undisturbed forest blocks within the Appalachian Plateau, the Daniel Boone National Forest, Bernheim Forest, Land Between the Lakes, and around Lake Cumberland. While there are no documented breeding pairs of golden eagles in Kentucky, and it is possible they pass through or near the Paducah area during the winter months. However, they prefer specific habitats, and western Kentucky is not a prime location for sightings (KDFWR, 2012).

3.5.3.2 *State-Listed Species*

While Kentucky does not have a comprehensive standalone State ESA, it provides protection by automatically listing species that are federally designated as endangered under the 301 Kentucky Administrative Regulation 3:061 and Kentucky Revised Statute § 150.183. As such, the Office of Kentucky Nature Preserves Biological Assessment Tool was accessed on September 11, 2025, to generate a report of endangered species, important natural communities, and conservation lands in a specified project area for which the Office of Kentucky Nature Preserves maintains data (OKNP, 2025). Refer to Appendix B, *Consultation Documents*, for a copy of the *Occurrence Report*.

Results of the report identified a total of seven state ranked (S-Rank) species; including three species (loggerhead shrike [*Lanius ludovicianus*], prairie milkweed [*Asclepias hirtella*], and rosinweed [*Silphium integrifolium*]) that have been documented within the DOE Paducah Site and/or WKWMA through direct field surveys and four S-Rank species with potential to occur within one mile of the GMPEF Site (northern crayfish frog [*Lithobates aeroelatus circulosus*], compassplant [*Silphium laciniatum*], cream wild indigo [*Baptisia leucophaea var. leucophaea*], and southeastern myotis [*Myotis austroriparius*]) (OKNP, 2025). Table 3-14 presents these species. Additionally, the *Occurrence Report* identified several Species of Greatest Conservation Need with historical ranges that overlap the GMPEF Site. S-Rank and Species of Greatest Conservation Need species are a scientific assessment used by conservation programs, but legal protection is a separate process that must be granted under either the Federal ESA or Kentucky State law.

Of the seven S-Rank species identified, only three species (*southeastern myotis, compassplant*, and *loggerhead shrike*) have potential suitable habitat within the approximately 107-acre GMPEF Site. None of these species have been historically observed within the DOE Paducah Site (DOE, 2024b) nor were they incidentally observed during various onsite ecological resource surveys that took place in 2025 for Parcel A and 2026 for Parcel C (CEC, 2025a; CEC, 2025b; CEC, 2025c; CEC, 2026a; CEC, 2026b; CEC, 2026c). Only the loggerhead shrike is protected under law (MBTA), all other species are regarded in the State Wildlife Action Plan that guides conservation efforts and decision-making (KDFWR, 2023).

3.5.4 Wetlands

Title 10 CFR Part 1022 establishes procedures for complying with Executive Order 11988, *Floodplain Management,* and Executive Order 11990, *Protection of Wetlands*. DOE takes steps to minimize or eliminate any impacts to wetlands. A waters delineation survey was conducted on July 28–30, 2025, to identify, characterize, and delineate wetlands, streams, and other waters located within the GMPEF Site. None of the onsite wetlands or streams delineated within the 100-acre area in 2025 were considered Waters of the United States under the jurisdiction of USACE (CEC, 2025a).

As discussed in Section 3.4.4,*Wetlands*, USACE granted an Approved Jurisdictional Determination for the 100-acre GMPEF Site within Parcel A and officially concurred with the "no permit required" determination, thus satisfying compliance with Section 404 of the CWA and Section 10 of the Rivers and Harbors Act (USACE, 2025b). The KDOW also issued concurrence that this project does not require a 401 Water Quality Certification due to the lack of jurisdictional impacts (refer to Appendix B, *Consultation Documents*, for a copy of the correspondence).

A subsequent waters delineation survey was conducted in June of 2026 to identify WOTUS features within the proposed 6.8-acre switchyard area located in Parcel C. Approximately 3.71 acres of wetland habitat (including approximately 3.65 acres of palustrine forested wetland and 0.06 acres of palustrine emergent wetland) were identified (CEC, 2026a). In compliance with Section 404 of the CWA, GeM will consult with USACE for impacts to any proposed WOTUS features and request a Jurisdictional Determination for waters identified within the switchyard area. For impacts to jurisdictional waters, GeM will submit either an application for a Section 404 Nationwide Permit or an Individual Permit (for significant impacts) to the USACE Louisville District office. A 404 Nationwide or Individual Permit will be obtained prior to construction of the switchyard area. Additionally, GeM will coordinate with the KDOW office to obtain 401 Water Quality Certification.

3.5.5 Environmentally Sensitive Areas

The GMPEF Site is not located within any designated environmentally sensitive areas. Land licensed to the WKWMA is located approximately 1.7 miles north of the site. Following recent land transfers, the WKWMA consists of approximately 4,494 acres of land within McCracken County for recreational use such as hunting, fishing, and horseback riding (KDFWR, 2025a).

3.6 Meteorology, Climatology, and Air Quality

Air quality refers to concentrations of various air pollutants in the atmosphere. Air quality is defined by the size and topography of the air basin, the local and regional meteorological influences, and the types and concentrations of pollutants in the atmosphere. This section describes the existing meteorology, climatology, and air quality conditions of the GMPEF Site and surrounding area. Additional details of these conditions are available in Section 3.2.1 of the PLEF EIS (GLE, 2025).

3.6.1 Meteorology

Due to its latitude and location on the eastern side of North America, the GMPEF Site experiences a humid subtropical climate. This climate is characterized by hot and humid summers, relatively mild winters, abundant precipitation, and minor differences in precipitation totals between seasons.

3.6.1.1 *Major Seasonal Synoptic Weather Pattern*

The weather in Kentucky is primarily influenced by the position of the polar jet stream and its associated storm systems and a large system of atmospheric high pressure known as the Bermuda High. Seasonal variations in the positions and strengths of these systems are key factors in the weather changes in the area.

During summer, the Bermuda High attains its greatest strength and most northerly position, where it is centered east of Kentucky. The counterclockwise atmospheric circulation around the Bermuda High brings warm and moist tropical air from the Gulf of America into the region. As a result, summers in Kentucky are usually hot and humid. Cumulus clouds and afternoon thunderstorms are common during the summer months. The remnants of tropical storms also can move into the region from the Gulf and can augment rainfall in late summer and early fall. Drier conditions occur when the Bermuda High moves westward over the region.

During winter, a weakening Bermuda High and an intensifying jet stream result in the frequent passage of polar storm systems through Kentucky. These storm systems bring rain and occasional ice or snow, followed by drier conditions due to the influence of cold continental air.

3.6.2 Climate

Meteorological data collected by the National Weather Service at Barkley Regional Airport, located approximately 3 miles southeast of the GMPEF Site, were used to describe the climatic conditions of the project site and adjacent area.

3.6.2.1 *Temperature*

Based on measurements at the Barkley Regional Airport, the average high and low temperatures for the warmest month of the year (July) are 89.9 and 69.4 degrees Fahrenheit (°F), respectively. The average high and low temperatures for the coldest month of the year (January) are 44.7 and 27.3 °F, respectively (MRCC, 2026a).

The highest temperature recorded at Barkley Regional Airport for the period from 1938 through August 2025 is 108 °F, which occurred in July 1942 and June 2012 (NWS, 2026a). The lowest temperature recorded during this period is -15 °F, which occurred in January 1985 (NWS, 2026b).

3.6.2.2 *Precipitation*

The mean annual precipitation for the Barkley Regional Airport is 50.3 inches (MRCC, 2026a). April and August are the wettest and driest months of the year, respectively. The highest 24-hour rainfall rate of 8.0 inches occurred on March 4, 1964 (NWS, 2026c).

The Paducah area receives occasional snowfalls. On average, the region receives about 9.0 inches of snow per year. The majority of snowfalls occur from December through March (MRCC, 2026a). On rare occasions, the Paducah area receives large snowfalls. The highest 24-hour snowfall rate of 14.2 inches occurred in December 2004 (NWS, 2026d).

Freezing rain poses a risk to power systems and trees. For the period 1948 through 2000 freezing rain on average occurred 2 to 3 days per year in the Paducah area and 6 to 9 hours per year (MRCC, 2026b).

Hail occurs in the project region, usually in association with thunderstorms. On average, damaging hail (greater than 0.75 inches in diameter) occurred from 4 to 6 days per year, based on data from 1986 to 2015 (Storm Prediction Center, 2026a). The high season for hail in the region is late spring.

3.6.2.3 *Winds*

Figure 3-23 shows a graphic of wind speed and wind direction frequencies (wind rose) for data recorded at the Barkley Regional Airport for the period 1973 to 2025 (Iowa Environmental Mesonet, 2026a). These data show that winds in the project area prevail from the south-southeast to southwest directions. The annual average wind speed at the airport is 7 miles per hour.

Extreme winds occur at Barkley Regional Airport due to events such as thunderstorm downdrafts, microbursts, or tornadoes. The highest wind gust measured at the airport from 1973 to 2025 was 84 miles per hour, which occurred during a severe thunderstorm on May 18, 1995 (Iowa Environmental Mesonet, 2026b).

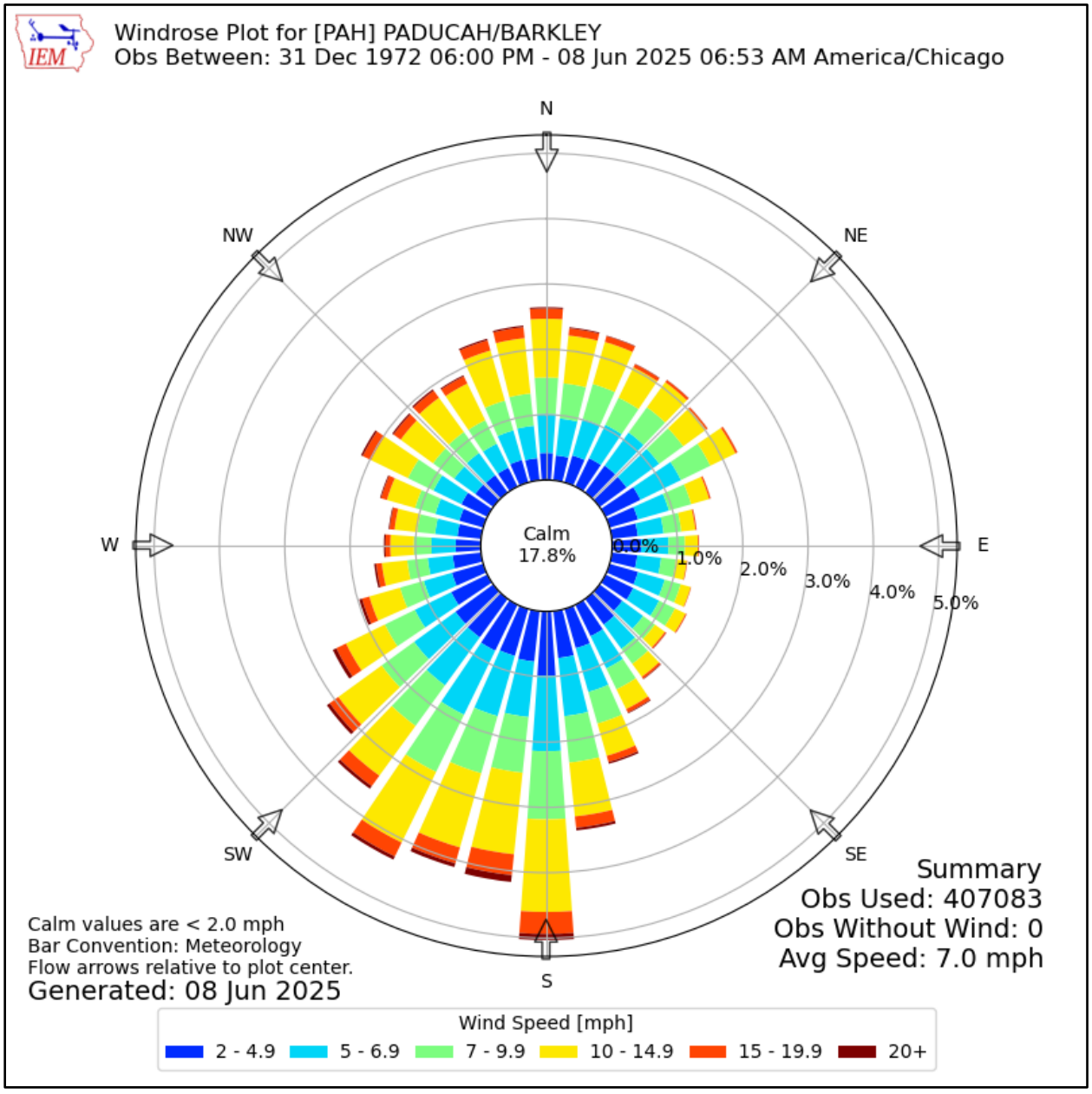


Figure 3-23: Wind Speed and Wind Direction Frequencies (wind rose) for Data Recorded at the Barkley Regional Airport for the Period 1973 to 2025

3.6.2.4 *Storms*

3.6.2.4.1 Thunderstorms

Thunderstorms occur approximately 54 to 63 days per year in the project area (National Oceanic and Atmospheric Administration, 2026). A common cause of thunderstorms is when cooler air associated with polar fronts converges with warm and moist Gulf air in the region. In comparison to the entire United States, the project area has a relatively high occurrence of thunderstorms. Rainfall in the region during the warmer months of the year mainly occurs from thunderstorms. Severe thunderstorms can produce lightning, damaging winds, and hail.

3.6.2.4.2 Tornadoes

Thirty tornadoes have been reported in McCracken County between 1950 and 2025. Of these tornadoes, 8 were estimated as F2 on the Fujita scale (winds of 113 to 157 miles per hour), 16 as F1 (winds of 72 to 113 miles per hour), and the remaining 6 as F0 (winds of 40 to 72 miles per hour). An F2 tornado occurred on March 3, 2023, and produced approximately $1.3 million in damage within the county (Storm Prediction Center, 2026b). Data for the period 1986 through 2015 show that a tornado occurred within 25 miles of the project site 1 to 1.25 days per year, which is the second highest rating for areas within the continental United States (Storm Prediction Center, 2026a).

3.6.2.5 *Mixing Heights*

The mixing height is the height above the surface of Earth where relatively vigorous atmospheric mixing occurs. The mixing height is an important parameter in predicting air pollutant concentrations because it generally determines the vertical extent of dispersion. Mean annual morning and afternoon mixing heights developed for the United States by Holzworth are used to describe conditions in the project area (Holzworth, 1972), because site-specific mixing height data is not available for Barkley Regional Airport.

The annual mean morning and afternoon mixing heights for the GMPEF Site are approximately 1,614 feet and 5,128 feet, respectively. The higher afternoon mixing height indicates the effects of convective energy produced from daytime heating by the sun.

3.6.3 Air Quality

3.6.3.1 *Applicable Air Quality Standards and Regulations*

3.6.3.1.1 Federal Standards and Regulations

The EPA, pursuant to the Clean Air Act (CAA), is the responsible Federal agency for developing, implementing, and enforcing national air pollution control programs. The CAA directs the EPA to establish National Ambient Air Quality Standards (NAAQS), which consist of two levels of standards. Primary NAAQS set limits to protect public health, including the health of sensitive populations, such as people with asthma and other respiratory conditions, children, and the elderly. Secondary NAAQS set limits to protect public welfare, prevent visibility impairment, and prevent damage to animals, crops, vegetation, and buildings. The EPA has set NAAQS for the following principal air pollutants, which are called criteria air pollutants (EPA, 2025h):

- Carbon monoxide (CO)
- Lead (Pb)
- Ozone (O_3)
- Nitrogen dioxide (NO_2)
- Particulate matter (PM)
- Sulfur dioxide (SO_2)

Table 3-15 presents the NAAQS for each criteria air pollutant. PM in the air is a mixture of solids and liquid droplets that vary in size. The NAAQS address two size categories of PM: (1) PM with diameters less than 10 micrometers (PM_{10}) and (2) PM with diameters less than 2.5 micrometers ($PM_{2.5}$). $PM_{2.5}$ are called fine particles and are produced by many types of combustion sources including motor vehicles, power plants, residential wood burning, forest fires, and agricultural burning, as well as some industrial processes. $PM_{2.5}$ poses the greatest public health concern because it can pass through the nose and throat and penetrate deep into the lungs.

Table 3-15: National Ambient Air Quality Standards

Pollutant	Averaging Period	Primary NAAQS	Secondary NAAQS
PM_{10}	24 hour	150 µg/m^3	150 µg/m^3
$PM_{2.5}$	Annual	9 µg/m^3	15 µg/m^3
	24 hour	35 µg/m^3	35 µg/m^3
SO_2	Annual	–	10 ppb
	1 hour	75 ppb	–
NO_2	Annual	53 ppb	–
	1 hour	100 ppb	–
O_3	8 hour	0.070 ppm	0.070 ppm
CO	8 hour	9 ppm	–
	1 hour	35 ppm	–
Lead	Rolling 3-month average	0.15 µg/m^3	0.15 µg/m^3

Source: 40 CFR 50

Key: CFR = Code of Federal Regulations; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards; NO_2 = nitrogen dioxide; O_3 = ozone; PM_{10} = particulate matter less than 10 microns in diameter; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; ppb = parts per billion; ppm = parts per million; SO_2 = sulfur dioxide; µg/m^3 = microgram per cubic meter

Ozone is formed in the atmosphere by photochemical reactions of previously emitted pollutants called precursors. Ozone precursors are mainly nitrogen oxides and photochemically reactive VOCs. In the presence of sunlight, the maximum effect of precursor emissions on ozone levels usually occurs several hours after they have been emitted and many miles from their source. Ozone concentrations are highest during the warmer months of the year and coincide with the period of maximum insolation. Inert pollutants, such as CO, tend to have the highest concentrations during the colder months of the year when light winds and nighttime/early morning surface-based temperature inversions inhibit atmospheric dispersion. Maximum inert pollutant concentrations usually are found near an emission source. Maximum PM_{10} concentrations can occur in combination with fugitive dust generated by ground-disturbing activities (such as the operation of vehicles on unpaved surfaces and agricultural activities) and high wind events.

Air toxics are air pollutants that are known or suspected of causing cancer or other serious health effects (e.g., reproductive effects or birth defects) or adverse environmental effects. The CAA establishes a list of hazardous air pollutants (HAPs) and directs the EPA to regulate emissions of these HAPs from stationary industrial sources. National ambient concentration standards for HAPs analogous to the criteria air pollutant NAAQS have not been established. Instead, the EPA develops and promulgates national air emission standards to limit the amount of HAP emissions released into the atmosphere from specific categories of stationary sources. These standards are called the National Emission Standards for Hazardous Air Pollutants and are based on implementing selected air pollutant control technologies or work practices (EPA, 2025i). Uranium enrichment operations are not a source category subject to the National Emission Standards for Hazardous Air Pollutants.

3.6.3.1.2 State of Kentucky Standards and Regulations

The Kentucky Division for Air Quality (KDAQ), under the Kentucky Energy and Environment Cabinet, is responsible for implementing and enforcing state and Federal air pollution control programs in Kentucky. The KDAQ enforces ambient air quality standards by monitoring air quality, developing rules to regulate and to permit stationary sources of air emissions, and managing the air quality attainment planning processes in Kentucky. The Kentucky General Assembly enacts state air pollution laws. Table 3-16 presents the Kentucky State ambient air quality standards (Kentucky General Assembly, 2026). The Kentucky ambient air quality standards directly adopt the NAAQS for CO, Pb, O_3, NO_2, PM_{10}, and SO_2, but there are differences between the state and national standards for $PM_{2.5}$. Additionally, Kentucky has its own ambient air quality standards for gaseous fluorides, hydrogen sulfide, odors, and total fluorides.

Table 3-16: Kentucky Ambient Air Quality Standards

Pollutant	Primary KAAQS	Secondary KAAQS
CO 8-hour average 1-hour average	 9 ppm [a] ($10\ mg/m^3$) 35 ppm [a] ($40\ mg/m^3$)	 – –
Pb rolling 3-month mean	$0.15\ \mu g/m^3$	Same as primary
NO_2 Annual arithmetic mean 1-hour average	 53 ppb ($100\ \mu g/m^3$) [b] 100 ppb	 Same as primary –
O_3 1-hour average 8-hour average 2015 standard 2008 standard 1997 standard	 0.12 ppm [c] 0.070 ppm 0.075 ppm 0.08 ppm [d]	 Same as primary [c] Same as primary Same as primary Same as primary [d]
PM, measured as PM_{10} 24-hour average	$150\ \mu g/m^3$	Same as primary
PM, measured as $PM_{2.5}$ Annual arithmetic mean 2012 standard 2006 standard 1997 standard 24-hour average 2012 standard 2006 standard 1997 standard	 $12.0\ \mu g/m^3$ $15.0\ \mu g/m^3$ $15.0\ \mu g/m^3$ $35\ \mu g/m^3$ $35\ \mu g/m^3$ $65\ \mu g/m^3$	 Same as primary [e] Same as primary [e] Same as primary [e] Same as primary [e] Same as primary [e] Same as primary [e]
SO_2 Annual arithmetic mean 1-hour average 3-hour average 24-hour average	 0.030 ppm [a, f] 75 ppb – 0.14 ppm [a, f]	 – – 0.5 ppm [a] –
Gaseous Fluorides (expressed as HF) Annual arithmetic mean 1-month average 1-week average 24-hour average 12-hour average	 $400\ \mu g/m^3$ (0.5 ppm) – – $800\ \mu g/m^3$ (1.0 ppm) [a] –	 – $0.82\ \mu g/m^3$ (1.00 ppb) [a] $1.64\ \mu g/m^3$ (2.00 ppb) [a] $2.86\ \mu g/m^3$ (3.50 ppb) [a] $3.68\ \mu g/m^3$ (4.50 ppb) [a]
Hydrogen Sulfide 1-hour average	 –	 $14\ \mu g/m^3$ (0.01 ppm)[a]
Odors	–	A mixture of one volume of ambient air and seven volumes of odorless air shall have no detectable odor at any time.
Total Fluorides Dry weight basis (as fluoride ion) in and on forage for consumption by grazing ruminants Average concentration of monthly samples over growing season (not to exceed 6 consecutive months): 2-month average 1-month average	 – – –	 40 ppm 60 ppm 80 ppm

Source: 401 KAR 53:010 State standards of quality for ambient air.

Table 3-16: Kentucky Ambient Air Quality Standards

Pollutant	Primary KAAQS	Secondary KAAQS

Key: CO = carbon monoxide; KAAQS = Kentucky Ambient Air Quality Standards; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; ppb = parts per billion; ppm = parts per million; PM = particulate matter; SO_2 = sulfur dioxide; $\mu g/m^3$ = microgram per cubic meter

Notes:

[a] Average is not to be exceeded more than once per calendar year.

[b] The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown for the purpose of clearer comparison to the 1-hour standard.

[c] The United States Environmental Protection Agency revoked the 1-hour ozone standard in all areas in 2005. However, some areas have continuing obligations under the standard.

[d] The United States Environmental Protection Agency revoked the 1997 8-hour ozone standard in 2015. However, some areas have continuing obligations under the standard.

[e] The secondary ambient air quality standard was not adjusted from the previously established standard.

[f] The 1971 sulfur dioxide standards remain in effect until 1 year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved, in accordance with 40 CFR Part 52, Subpart S.

The KDAQ does not regulate air emissions of radionuclides from sources. The State agency responsibility for regulation of the possession, use, transfer, transportation, and disposal of radioactive materials within Kentucky is the Radiation Health Branch of the Cabinet for Health and Family Services. Ambient air radionuclide monitoring at the GMPEF Site and surrounding area would be conducted under the supervision of the radiation protection supervisor as discussed in Section 3.11, Public and Occupational Health.

3.6.3.2 *Regional Ambient Air Quality*

The KDAQ and Louisville Metro Air Pollution Control District operate and maintain air monitors to measure ambient air concentrations of criteria air pollutants at more than 30 locations around the State (KDAQ, 2025) The final data recorded for each monitoring station are reported to the EPA's Air Quality System database, which compiles and summarizes nationwide ambient air monitoring data.

There is one ambient air monitoring station currently operating in the vicinity of the GMPEF Site that measures criteria pollutants. This station, the Paducah Transit monitor (AQS Site ID 21145-1027) located in Paducah, monitors O_3, NO_2, SO_2, and $PM_{2.5}$ and is operated by KDAQ. The closest CO and PM_{10} monitoring stations to the GMPEF Site are the Evansville-Lloyd and Evansville-Buena Vista monitors in Indiana, respectively. There are no Pb monitoring stations near the GMPEF Site. From 1990 to 2022, O_3, NO_2, PM_{10}, $PM_{2.5}$, and SO_2 were measured at the Jackson Purchase monitoring station, which was located 2.8 miles southeast of the current Paducah Transit monitor. That station was decommissioned and replaced with the Paducah Transit monitoring station in 2023.

From 2022 through 2024, ambient concentrations of NO_2 and SO_2 measured at the Paducah monitoring station did not exceed the applicable NAAQS and State standard levels (EPA, 2026b). During this period, O_3 concentrations exceeded the 8-hour 2015 standard of 0.070 parts per million (ppm) once in 2022 and 2024 and six times in 2023. However, the definition of the 2015 O_3 standard is based on the annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years; this statistic for the period 2022 through 2024 equates to 0.067 ppm, which is slightly below the standard. During this monitoring period, $PM_{2.5}$ concentrations exceeded the 24-hour 2012 standard of 35 microns per cubic meter once in 2022 and twice in 2023. The definition of the 2012 $PM_{2.5}$ standard is based on the annual 98th percentile value, averaged over 3 years and the value of this metric for the period 2022 through 2024 equates to 22 microns per cubic meter, which is well below the standard.

As defined in the CAA, the EPA issues a legal status designation about whether an area violates a NAAQS or contributes to a NAAQS violation in a neighboring area. An attainment area is defined as a geographic

area that meets the NAAQS. The EPA designates an area as a nonattainment area if air quality monitoring shows that the area violates a NAAQS for a given criteria pollutant. An area could be a nonattainment area for one NAAQS and an attainment area for other NAAQS. A nonattainment area can be redesignated as an attainment area if can maintain the applicable standard for at least 10 years. These areas are called maintenance areas. Currently, the EPA designates McCracken County and its neighboring counties as attainment areas for all NAAQS (EPA, 2026c).

3.6.3.3 *Existing Air Emissions*

Currently, most of the existing GMPEF Site has been cleared and rough graded; it has no substantial air emissions. A depleted uranium hexafluoride (DUF_6) cylinder storage yard associated with the adjacent DOE Paducah Site (former PGDP) would be part of the project site. Emissions associated with this existing storage yard are limited to occasional use of mobile equipment to handle cylinders of DUF_6.

The nearest substantial source of emissions in proximity to the project site is the DOE Paducah Site. The DOE Paducah Site processes DUF_6 into uranium oxide powder, aqueous hydrogen fluoride (HF), and calcium fluoride. The environmental remediation, waste management, and decontamination and decommissioning missions at the DOE Paducah Site operate under a KDAQ sitewide Title V permit (DOE, 2025e). The conversion facility building and HF loading area operate under a KDAQ conditional major operating air permit for purposes of controlling HF vapors and particulate uranium oxide (KDAQ, 2021). Activities at the DOE Paducah Site that could generate fugitive emissions include the transport and disposal of waste, decontamination of equipment, and environmental remediation activities. Annual air emissions for the DOE Paducah Site due to operations under the Title V and conditional major operating air permits are available from the KDAQ.

Radionuclide releases to the atmosphere occur at the DOE Paducah Site. Atmospheric releases of radionuclides are discussed further in Section 3.11, *Public and Occupational Health*.

3.7 Noise and Vibration

Noise is generally defined as unwanted sound. Sound level is described using a logarithmic unit of measure, the decibel (dB). Normal speech equates to a sound level of approximately 60 dB and sound levels above 120 dB begin to be felt inside the human ear as discomfort. The lower threshold of human hearing is 0 dB. Outside of controlled laboratory conditions, a 1-dB change is generally imperceptible, a 3-dB change is barely noticeable, and an increase of about 10 dB is perceived as roughly twice as loud and often results in an adverse community response. When summing noise generated by two dB sources, the louder noise source is the dominant factor in determining overall sound level. Addition of a sound level that is 10 dB less than another sound level has a negligible effect on the overall sound level.

Sound waves can occur at many different wavelengths, also known as the frequency. Frequency is the number of wave cycles per second that occur and is measured in hertz (Hz). The typical human ear can hear frequencies ranging from approximately 20 to 20,000 Hz. Normally, the human ear is most sensitive to sounds in the middle frequencies (1,000–8,000 Hz) and is less sensitive to sounds in the lower and higher frequencies. As such, the A-weighting scale was developed to simulate the frequency response of the human ear to sounds at typical environmental levels. Sound levels referenced on the A-weighted scale are denoted A-weighted decibel (dBA).

Sound in the environment is constantly fluctuating, as when a car drives by, a dog barks, or a plane passes overhead. Therefore, sound metrics have been developed to quantify fluctuating environmental sound levels. Sounds can be described intuitively using their maximum level. For construction equipment, the maximum noise level would be experienced while the equipment is operating at full power. Sound environments can also be described using the sound level exceeded during some percentage of a specified time. For example, the sound level that is exceeded 50 percent of the time during a 1-hour measurement period (abbreviated as “1-hour L50”) is often used to describe existing noise environments. Common exceedance sound level values

are the 10-, 50-, or 90-percentile exceedance sound levels, denoted by L10, L50, and L90. The equivalent-continuous sound level (L_{eq}) is the logarithmic average of the varying sound level over a given time period and is the most common metric used to describe sound. When sound levels are logarithmically averaged over a 24-hour period with a 10 dB penalty applied to noise events between 10:00 p.m. and 7:00 a.m., the resulting sound descriptor is the day-night average sound level (L_{dn}).

Like noise, perceptible vibration also has the potential to be annoying. The intensity of vibrations, as perceived by humans, is described using decibels of vibration velocity (VdB). Humans are typically able to perceive vibrations at greater than 65 VdB (FTA, 2018). A person standing 100 feet from a rail line during a freight train pass-by typically experiences approximately 82 VdB (Southwest Light Rail, 2015). Certain types of heavy construction equipment generate noticeable vibrations in nearby areas. It is unusual for vibration from sources such as buses and trucks to be perceptible, even in locations close to major roads (FTA, 2018).

3.7.1 Baseline Sound Conditions

A baseline sound survey was completed to characterize the existing acoustical environment of the nearby PLEF Project Area. The PLEF Project Area has a variety of surrounding land uses, which are described in Section 3.1, *Land Use.* The most sensitive land uses acoustically are the residential areas to the south of the PLEF Project Area. Other land uses adjacent to the PLEF Project Area include agricultural and undeveloped land. The information collected in this survey is useful for determining the likely noise environment for the GMPEF Site and is summarized below.

3.7.1.1 *PLEF Sound-Survey Monitor Locations*

The PLEF baseline sound survey incorporated two environmental sound monitors at two positions at the extents of the PLEF Project Area to characterize the existing acoustical environment. There are several single-family homes, and agricultural properties located adjacent to the PLEF Project Area. Sound-level monitoring was conducted to measure the ambient sound levels near the property lines in the direction of the nearest residential neighbors to the south (NRC, 2026).

Two sound Monitor Positions (MP1 and MP2) in the PLEF Project Area were selected (GLE, 2025). The locations, which are shown on Figure 3-24, were used to measure existing community sound levels as they are the closest available locations to measure the sound-level exposure that homes south of the PLEF Project Area would experience from sound generated by the PLEF facilities. The sound monitor locations are:

- MP1 Sound monitor located along the southwestern edge of the PLEF Project Area near the intersection of Woodville Road and Hobbs Road. The closest residential neighbors to the PLEF and GMPEF Sites are located on Woodville Road, just across the street and to the south of MP1.
- MP2 Sound monitor located at the southeast corner of the PLEF Project Area. The closest residential neighbors to the PLEF and GMPEF Sites are located on Woodville Road, just across the street and to the south of MP2.

The closest residence to the GMPEF Site is approximately 4,300 feet south along Woodville Road.

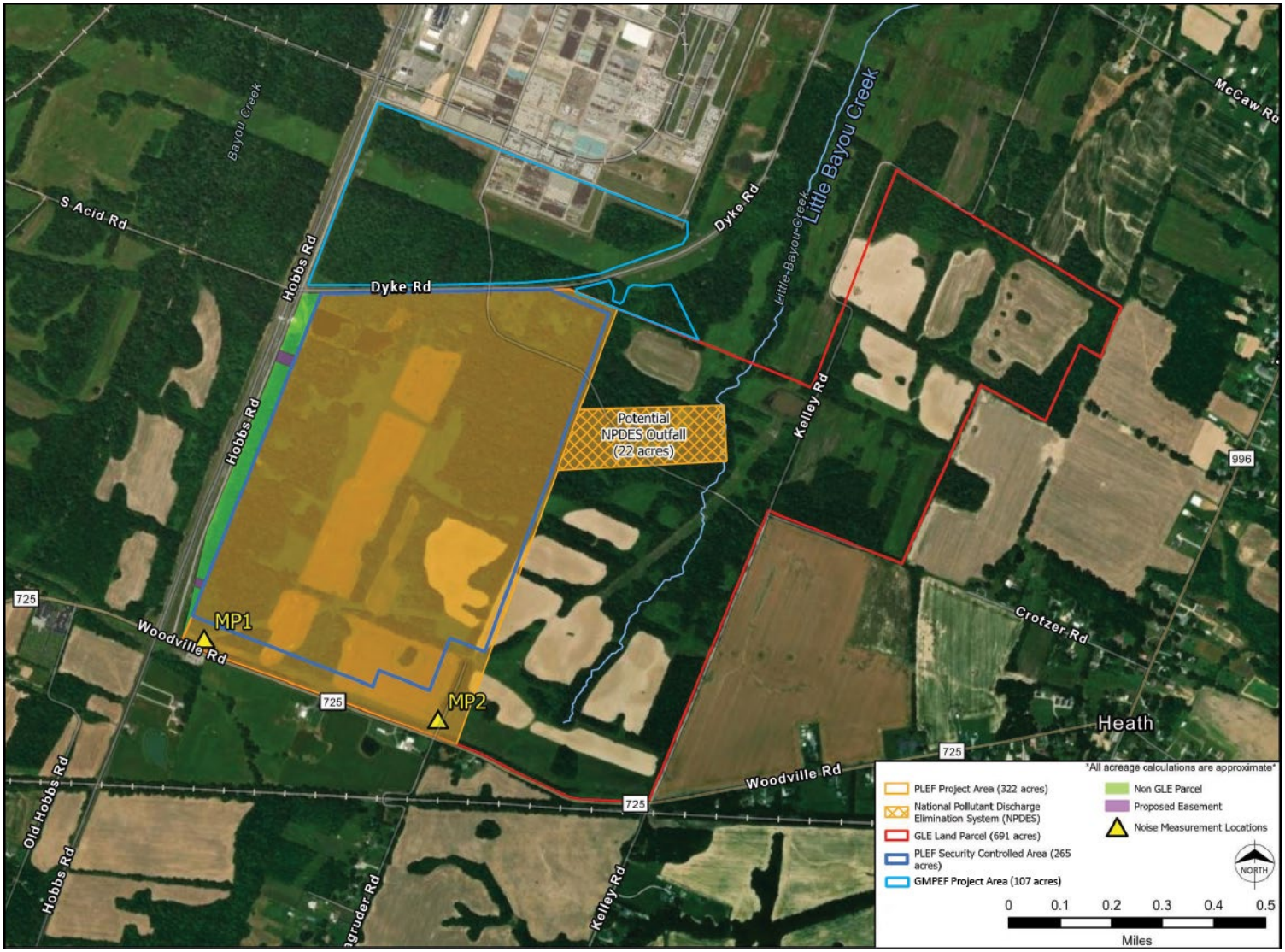


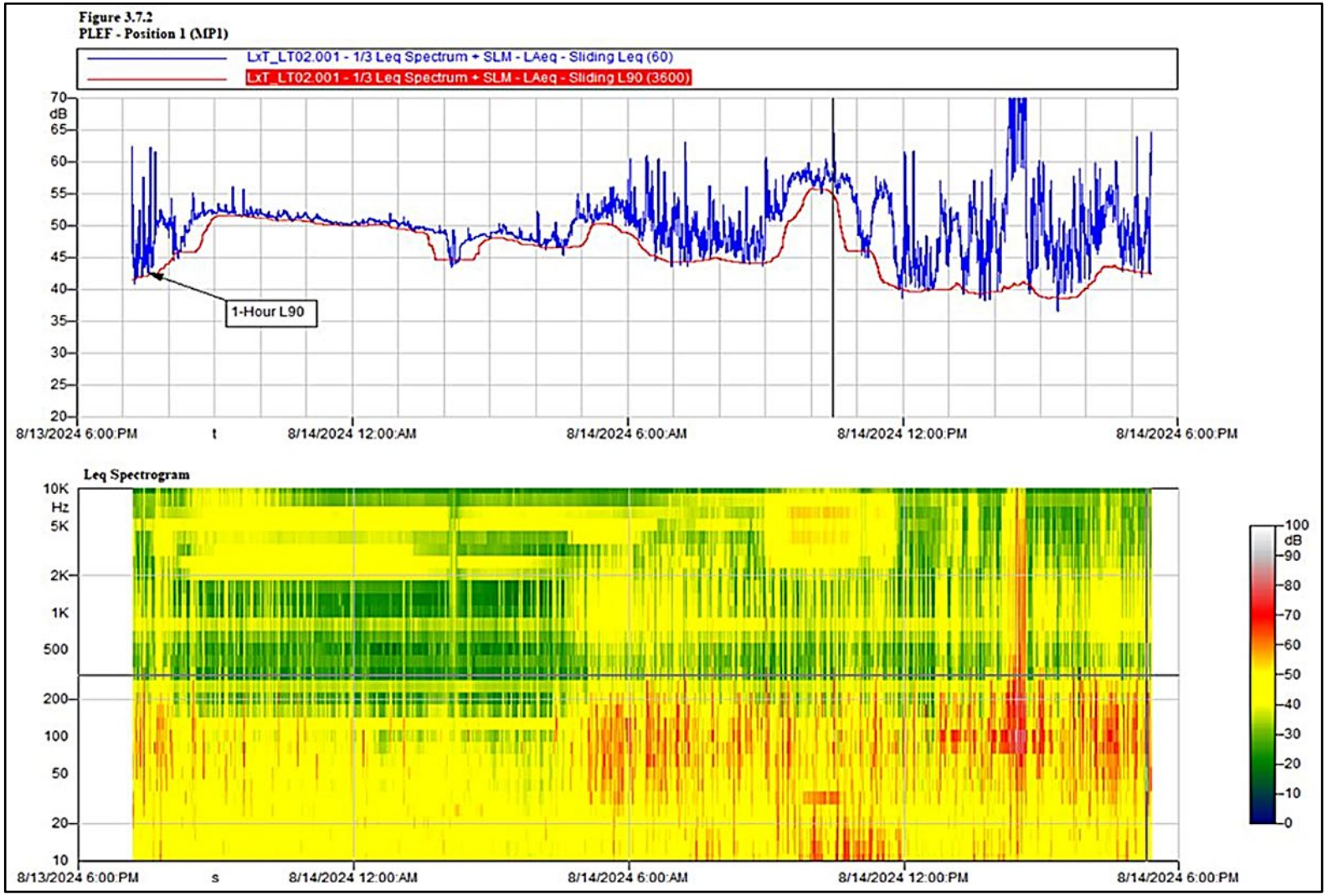
Figure 3-24: Noise Measurement Locations

3.7.1.2 *Existing Sound Sources Observed*

There were a number of natural and human-generated noise sources that were observed during the PLEF sound survey. The natural sounds included birds singing/calling and insects chirping/peeping; these insect noises are evident in the octave-band data as constant increased levels above 2,000 Hz during the nighttime measurements. Human activity in the area surrounding the PLEF Site included local vehicular traffic, distant vehicular traffic on surrounding roads, and the Woodville Road substation. It was evident from the data that heavy trucks likely pulled into the substation yard or a location near MP1 and idled for a period of time (NRC, 2026).

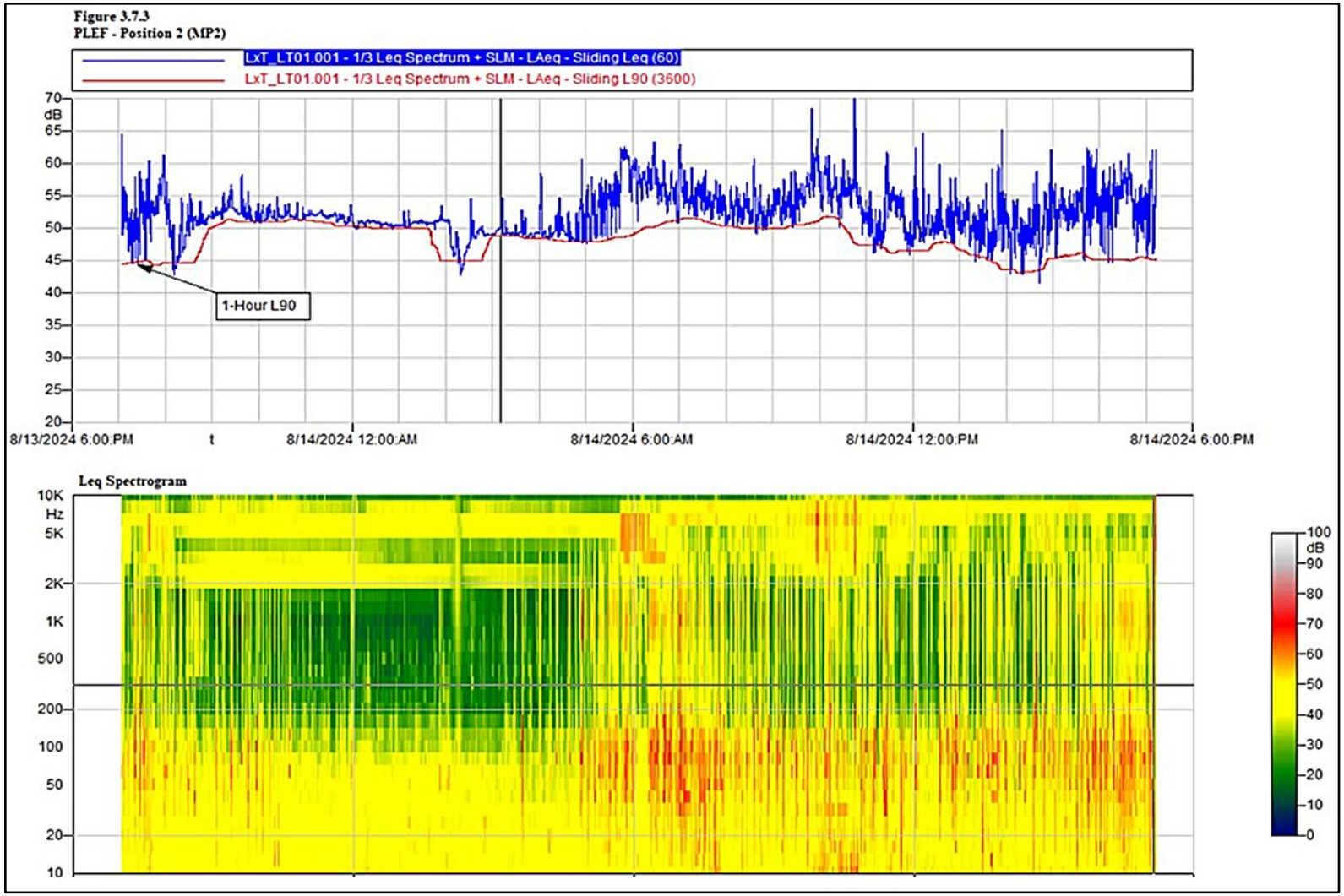
3.7.1.3 *Site Sound-Survey Monitor Results*

The sound-level data obtained by MP1 and MP2 over the survey period are plotted on Figure 3-25 and Figure 3-26 (GLE, 2025). On these graphs, the blue lines indicate the energy equivalent-sound levels for each 1-minute period. The red line represents the sound level that was exceeded 90 percent of the time in each 1-hour period; this sound level represents the steady-state sound level that is often considered the ambient sound level without the influence of short-duration spikes in sound, such as passing traffic. The continuous octave-band spectra data are also shown on Figure 3-25 and Figure 3-26. The graphs present the 1-second L_{eq} octave-band sound-level data from the measurement period corresponding to the 1-minute -L_{eq} and 1-hour L_{90} shown on the graphs above the spectra data.



Source: GLE (2025)

Figure 3-25: MP1 Sound Level Graph



Source: GLE (2025)

Figure 3-26: MP2 Sound Level Graph

A summary of the results from the baseline sound survey is shown in Table 3-17. In this table, the "day" time period is between 7:00 a.m. and 10:00 p.m., whereas the "night" time period is between 10:00 p.m. and 7:00 a.m. These sound levels represent typical ambient conditions at the intersection of Hobbs Road and Woodville Road, south of the PLEF and GMPEF Sites. The calculated L_{dn} values at the two monitoring locations were 61 and 60 dBA, respectively. These values exceed the EPA guideline level of 55 dBA L_{dn} but remain below the NRC acceptable limit of 65 dBA L_{dn}.

Table 3-17: Hourly Average and Daytime/Nighttime Sound Levels

Time	MP1 [dBA]			MP2 [dBA]		
	L_{eq}	L_{50}	L_{90}	L_{eq}	L_{50}	L_{90}
8/13/24 8:00 p.m.	51	51	46	51	50	45
8/13/24 9:00 p.m.	52	52	52	53	52	51
8/13/24 10:00 p.m.	52	51	51	52	52	51
8/13/24 11:00 p.m.	51	51	50	52	52	51
8/14/24 12:00 a.m.	51	51	50	51	51	50
8/14/24 1:00 a.m.	50	50	49	51	51	50
8/14/24 2:00 a.m.	48	48	45	49	49	45
8/14/24 3:00 a.m.	49	49	48	50	49	49
8/14/24 4:00 a.m.	49	48	47	51	49	48
8/14/24 5:00 a.m.	53	52	50	57	50	48
8/14/24 6:00 a.m.	53	50	45	57	55	50
8/14/24 7:00 a.m.	51	47	45	56	53	51
8/14/24 8:00 a.m.	48	46	44	53	51	50
8/14/24 9:00 a.m.	56	56	50	57	53	51
8/14/24 10:00 a.m.	57	57	55	61	55	50
8/14/24 11:00 a.m.	52	51	42	53	50	46
8/14/24 12:00 p.m.	50	43	40	54	49	48
8/14/24 1:00 p.m.	50	47	39	53	48	45
8/14/24 2:00 p.m.	71	53	41	52	47	43
8/14/24 3:00 p.m.	50	45	39	55	51	46
8/14/24 4:00 p.m.	52	49	44	55	51	45
8/14/24 5:00 p.m.	51	47	42	50	50	45
Daytime Average	61	51	47	56	51	48
Nighttime Average	51	50	49	53	51	49
Day/Night L_{dn} Average	61	57	55	60	58	56

Source: (GLE, 2025)
Key: dBA = A weighted decibel; L_{dn} = day-night average sound level; L_{eq} = equivalent-continuous sound level; MP = Monitor Position

3.7.2 Baseline Vibration Conditions

Given the rural nature of the area, ground vibrations induced by human activities can be assumed to be minimal. As noted previously, it is unusual for vibration from sources such as buses and trucks to be perceptible, even in locations close to major roads (FTA, 2018).

3.7.3 Noise and Vibration Guidelines

Neither McCracken County nor the State of Kentucky have established quantitative limitations on acceptable community sound levels. Therefore, Federal regulations and criteria for noise and vibration are applied in this analysis.

EPA has identified 55 dBA L_{dn} outdoors as a noise level adequate to protect public health and welfare with an adequate margin of safety (EPA, 1974). At this level, noise is audible but not expected to result in

activity interference or excessive annoyance. These values are not regulatory standards; rather, they are conservative recommendations intended to protect the most sensitive subpopulations. To prevent hearing loss from long-term exposure to non-impulsive noise, the EPA also recommends that the 24-hour L_{eq} not exceed 70 dBA when averaged over a 40-year exposure period. For the NRC, NUREG-1555 considers noise levels acceptable when the L_{dn} outside a residence is below 65 dBA (NRC, 2000a). This criteria level is consistent with the U.S. Department of Housing and Urban Development exterior noise standard specified in 24 CFR 51.101(a)(8).

Hearing conservation regulations, such as the Occupational Safety and Health Administration regulations published at 29 CFR 1910.95, are applicable to workplace environments. In accordance with Occupational Safety and Health Administration and similar regulations, workers are required to wear hearing protection in environments where potentially hazardous noise levels exist.

The U.S. Federal Transit Administration (FTA) has adopted criteria for use in the assessment of potential vibration impacts. For frequent events (occurring more than 70 times per day) at residences, the FTA has established vibration levels of less than 72 VdB as being generally acceptable, and vibration levels below 65 VdB are not typically perceptible (FTA, 2018).

3.8 Historical and Cultural Resources

As defined under 36 CFR 800.16(l)(1), "Historic property means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places [NRHP] maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria."

The preservation of these historic properties is regulated by government laws and regulations, including the National Historic Preservation Act (NHPA) of 1966, as amended. The NHPA establishes policies and procedures for the preservation of historic resources by government entities for properties listed on or eligible for listing on the NRHP. In addition, the NHPA encourages state and local historic preservation by the establishment of local preservation offices and regulations. The 2006 Cultural Resources Management Plan (DOE, 2006) provides historic preservation guidance and procedures for compliance with the NHPA.

Section 106 requires Federal agencies to consider effects of their undertakings on historic properties. The Area of Potential Effects (APE) is defined in Section 3.8.3.1, *Physical Extent of Survey*. Other sections include the results of the records review of known cultural resources and previous investigations and documentation of regulatory coordination with the Kentucky Heritage Council and the Kentucky Office of State Archaeology. This document also summarizes the findings of the cultural resources surveys of the APE and NRHP significance evaluations.

Cultural resources are evaluated for their NRHP significance within the historic context of the Project Area. The prehistory of the continental Midwest is generally divided into four broad periods: Paleoindian, Archaic, Woodland, and Mississippian. Additional background information is available in Section 3.8 of the PLEF Draft EIS (NRC, 2026).

3.8.1 Extent of Historical and Cultural Resource Analysis

The APE represents the geographic area where the Proposed Action has the potential to directly and/or indirectly affect historic properties. The proposed physical APE is defined as the entire project area, which is where direct impacts from ground-disturbing activities during construction would occur. The current

GMPEF Project Area covers 107 acres, which includes Leasing Parcel A (100 acres) and a portion of Leasing Parcel C (6.8 acres).

The proposed indirect APE includes a buffer around the physical APE to account for potential non-physical effects (e.g., visual, auditory, atmospheric) to historic properties. It extends 0.25 miles (400 meters) around the Project Area.

Direct effects from the undertaking may include physical, visual, auditory, or olfactory effects to historic properties. Indirect effects may be of the same range of effects (physical, visual, auditory, or olfactory); however, indirect effects are those caused by the undertaking that occur later in time or are farther removed in distance (but remain still reasonably foreseeable).

3.8.2 Known Cultural Resources in the Area

Prior to completing the 2025 fieldwork, Cultural Resource Analysts completed a search of records maintained by the NRHP and the Kentucky Office of State Archaeology to (1) determine if the project area had been previously surveyed for archaeological resources; (2) identify any previously recorded archaeological sites that were situated within the project area; (3) provide information concerning what archaeological resources could be expected within the project area; and (4) provide a context for any archaeological resources recovered within the project area. The 2-kilometer radius included areas within the Heath, Kentucky, quadrangle (Martin, 2025a). A second records search was conducted of the entirety of Parcel C and a 2-kilometer radius around the Parcel (Martin, 2025b).

3.8.2.1 *Archaeological Sites*

Five archaeological sites (15McN94, 15McN103, and 15McN253–15McN255) have been recorded in the 2-kilometer radius around the project area in Leasing Parcel A. None of the previously recorded archaeological sites intersect with the current project area. A search of the NRHP records indicated that no archaeological sites listed in the NRHP were situated within the current project area or within a 2-kilometer radius of the project area (Martin, 2025a). The Leasing Parcel C survey identified six archaeological sites. Only site 15McN261 was located within the boundary of Leasing Parcel C. None of the archaeological sites within the project area were eligible for listing in the NRHP.

Additional details of these conditions are available in Section 3.8 of the PLEF ER (GLE, 2025) and Section 3 of the Phase I Archaeological Reconnaissance for Leasing Parcel A, McCracken County, Kentucky (Martin, 2025a). Additional information for the switchyard area in Parcel C can be found in A Phase I Archaeological Reconnaissance of Parcel 1 at the Paducah Gaseous Diffusion Plant, McCracken County, Kentucky (Martin, 2025b).

3.8.2.2 *Historic-Age Non-Archaeological Resources*

A total of 171 resources are within 2 kilometers of the GMPEF Project Area. The PGDP, located directly north of the GMPEF Project Area, was surveyed in 2004 and was determined to constitute the NRHP-eligible PGDP Industrial Complex Historic District. The district is eligible under National Register Criterion A due to its military significance during the Cold War. The PGDP Industrial Complex Historic District is composed of 158 previously recorded historic-age resources. Of these, 121 are located within 2 kilometers of the GMPEF Project Area including one NRHP contributing resource. The PGDP is currently being decommissioned. Other than the PGDP, there are five previously recorded historic-age resources and one cemetery located within 2 kilometers of the Project Area. None of the previously recorded resources intersect the Project Area (Martin, 2025a)

Additional details of these conditions are available in Section 3.8 of the PLEF Draft EIS (NRC, 2026) and Section 3 of the Phase I Archaeological Reconnaissance for Leasing Parcel A, McCracken County, Kentucky

(Martin, 2025a). Additional information for the switchyard area in Parcel C can be found in A Phase I Archaeological Reconnaissance of Parcel 1 at the Paducah Gaseous Diffusion Plant, McCracken County, Kentucky (Martin, 2025b).

3.8.3 Archaeological or Historical Surveys

A total of six previous professional archaeological investigations have been conducted within a 2-kilometer radius of the GMPEF project area. In addition, five archaeological sites have been recorded in the 2-kilometer radius. None of the previously recorded archaeological sites intersect with the current project area. A search of the NRHP records indicated that no archaeological sites listed in the NRHP were situated within the current project area or within a 2-kilometer radius of the project area (Martin, 2025a).

In late 2024, a phase I archaeological survey for the proposed GMPEF project area in McCracken County, Kentucky (Martin, 2025a). The investigation covered the 100 acres of the Parcel A lease. The survey methods consisted of systematic screened shovel testing, pedestrian survey, and visual inspection of obviously disturbed areas. As a result of the survey, three archaeological sites (15McN253–15McN255) and an isolated find (IF 1) were documented. Site 15McN253 was a historic farmstead/residence dating to the early through mid-20th centuries. Site 15McN254 was a historic farmstead/residence dating to the late 19th through 20th centuries. Site 15McN255 was a historic outbuilding at a farmstead dating to the late 19th through 20th centuries. IF 1 was a precontact flake that cannot be attributed to a cultural/temporal period. As a result of the investigation, the sites and IF were determined to not have archaeological integrity and were recommended not eligible for inclusion in the NRHP. No further work was recommended for these sites (Martin, 2025a).

In May of 2025, the investigation for the A Phase I archaeological survey for the proposed switchyard project area in McCracken County, Kentucky, covered approximately 206 acres and consisted of systematic screened shovel testing, pedestrian survey, and visual inspection of obviously disturbed areas (Martin, 2025a). As a result of the survey, six archaeological sites (15McN257–15McN262) and a non-site locality was identified (NSL 1) and all were documented. Sites 15McN257–15McN260 and 15McN262 are historic farms/residences that date between the late 19th and 20th centuries. Site 15McN261 is a historic outbuilding dating to the late 19th through 20th centuries. Sites 15McN257– 15McN262 lack archaeological integrity and are recommended not eligible for inclusion in the NRHP. No further work is recommended for Sites 15McN257–15McN262 and archaeological clearance is recommended for the project. As a result of the investigation, the sites and NSL were determined to not have archaeological integrity and were recommended not eligible for inclusion in the NRHP. No further work was recommended for these sites (Martin, 2025b; Martin, 2025a).

In 2006, a Cultural Resource Management Plan (CRMP) was prepared for the PGDP (DOE, 2006). This plan identifies the PGDP as containing 161 primary buildings, as well as additional structures associated with the gaseous diffusion process, including cooling towers, electrical switchyards, administrative buildings, warehouses, and water treatment facilities. The CRMP provides procedures for managing cultural resources on the PGDP property. It was determined DOE will either conduct archaeological surveys or consult with the Kentucky State Historic Preservation Officer (SHPO) on the need for such surveys, only when a ground-disturbing activity is proposed in previously undisturbed areas of DOE property. For sale/transfer of DOE property, the CRMP reiterates the Programmatic Agreement requirement of a deed stipulation requirement for the management of sold/transferred property in compliance with the NHPA and in coordination with the SHPO and Advisory Council on Historic Preservation (Martin, 2025a).

In 2015, an EA was prepared for potential land and facility transfers at the PGDP. This EA differentiates the major parts of the PGDP, including the Main PGDP Plant, located within the security fenced industrial area, as well as unlicensed DOE property, including a landfill and industrial land outside the fenced area,

and DOE land previously licensed to the State of Kentucky as part of the WKWMA. In the summary of the affected environment concerning cultural resources within the EA, it mentions that the undeveloped land previously utilized by the WKWMA could contain undiscovered archaeological deposits and other potential cultural resources. It was determined through consultation with the Kentucky SHPO and Native Indian tribes that there would be no adverse effects to DOE-built properties from future real property transfers, but that there is a potential for impacts that could occur either indirectly or directly depending on future development activities and locations. Specifically, cultural resource surveys to identify historic properties would have to be undertaken before the initiation of any new construction, especially in areas of undeveloped land (Martin, 2025a). Additional details of this survey are available in Section 3 of the Phase I Archaeological Reconnaissance for Leasing Parcel A, McCracken County, Kentucky (Martin, 2025a).

A review of available records and field investigations also found no historic cemeteries within the project area that are listed in, or eligible for listing in, the NRHP.

3.8.3.1 *Physical Extent of Survey*

The APE survey area covered all of Leasing Parcel A at the DOE Paducah Site in McCracken County, Kentucky. An additional survey, consisting of 206 acres along the eastern perimeter of the Paducah facility, was conducted in 2025 (Martin, 2025b). The total area investigated for archaeological resources covers approximately 293.4 acres (Martin, 2025b; Martin, 2025a). Additional details of this survey are available in Section 1 of the Phase I Archaeological Reconnaissance for Leasing Parcel A, McCracken County, Kentucky (Martin, 2025a) and Section 1 of the Phase I Archaeological Reconnaissance of Parcel 1 at the Paducah Gaseous Diffusion Plant, McCracken County, Kentucky (Martin, 2025b).

3.8.3.2 *Description of Survey Techniques*

Field methodology for the Parcels A and C archaeological surveys was determined by ground surface visibility, the slope of the landforms, and previous disturbances. Shovel testing was conducted on level upland landforms characterized by vegetation that included mature forest and tall grass/briar vegetated areas that exhibited less than 10 percent ground surface visibility. For Parcel A, the systematic shovel testing survey involved excavating grids of shovel test probes spaced at 20-meter transect intervals. In forested portions of the project area, the grids were aligned with magnetic north. The portion of the project area in an overhead power transmission line corridor vegetated with tall grasses/briars, and other areas situated outside of forested tracts, the shovel test transects were aligned with the observed forest boundaries.

In all cases, shovel tests measured not less than 35.0 centimeters in diameter and extended well into the subsoil. All fill removed from the shovel tests was screened through 0.25-inch mesh hardware cloth, and the sidewalls and bottoms were examined for cultural material and features. General soil characteristics were recorded by individual level for unique shovel test profiles and all positive shovel tests.

In general, reduced-interval testing (10 meters) was only conducted at the exterior of sites to further define site boundaries. Reduced-interval tests on the interior of sites were not conducted with the assumption that these areas would contain cultural material. Judgmentally positioned shovel tests were situated near the former structure locations and document the potential for intact archaeological deposits at cultural features. Approximately 89.5 percent of the project area (78.2 acres) was investigated using systematic shovel testing survey. Many of the shovel test soil profiles indicated the landform in the project area was poorly drained. The observed soil profiles in some shovel-tested areas indicated comprehensive disturbances (Martin, 2025a).

Most of the remaining areas in the project area were heavily disturbed and covered approximately 8.7 acres. The disturbed areas were mostly located at mechanically contoured rises within the overhead

power transmission line corridor, a gravel access road, and a marked buried natural gas pipeline. A water inundated area that covered approximately 0.5 acres was documented within a portion of the transmission line corridor (Martin, 2025a). Additional details of this survey are available in Section 4 of the Phase I Archaeological Reconnaissance for Leasing Parcel A, McCracken County, Kentucky (Martin, 2025a).

Field methodology for Parcel C (Martin, 2025b) consisted of shovel testing conducted on level upland landforms characterized by vegetation that included mature forest and tall grass/briar vegetated areas that exhibited less than 10 percent ground surface visibility. The systematic shovel testing survey involved excavating grids of shovel test probes spaced at 20-meter transect intervals. In general, reduced-interval testing (10 meters) was only conducted at the exterior of sites to further define site boundaries.

Shovel testing was performed at 5-meter spacing at some archaeological sites that possessed low artifact density but also required additional work to assess the extent of previous disturbances. Judgmentally positioned shovel tests were situated near the former structure locations and documented the potential for intact archaeological deposits at cultural features. Approximately 97 percent of the project area was investigated using systematic shovel-testing survey. A majority of the shovel test soil profiles indicated much of the project area was poorly drained. The observed soil profiles in some shovel-tested areas indicated comprehensive disturbances. A majority of the remaining areas in the project area were heavily disturbed and covered approximately 4.7 acres.

Overall, the modern region contains oak or oak-hickory forest and prairie areas or barrens (most in cultivation now) in the uplands, and phases of swamp forest in the alluvial valleys. Both Leasing Parcel A and Leasing Parcel C show similar environmental conditions and disturbance. Additionally, both have historic resources that lack archaeological integrity and are recommended not eligible for inclusion in the NRHP.

3.8.3.3 *Survey Findings*

As a result of the Leasing Parcel A survey, one previously unrecorded archaeological site (15McN256) was identified. Site 15McN256 is a historic farmstead/residence dating to the late 19th through 20th centuries. The site does not have archaeological integrity and is recommended not eligible for inclusion in the NRHP. The survey for Leasing Parcel C recorded six archaeological sites and one NSL.

No further work is recommended for Leasing Parcel A or Leasing Parcel C and archaeological clearance is recommended for the project (Martin, 2025b; Martin, 2025a). Additional details of this survey are available in Section 3 of both the Phase I Archaeological Reconnaissance for Leasing Parcel A, McCracken County, Kentucky (Martin, 2025a) and Phase I Archaeological Reconnaissance of Parcel 1 at the Paducah Gaseous Diffusion Plant, McCracken County, Kentucky (Martin, 2025b).

3.8.4 List of Historical and Cultural Properties

The list of historical and cultural properties is available in Section 3 of the Phase I Archaeological Reconnaissance for Leasing Parcel A, McCracken County, Kentucky (Martin, 2025a).

3.8.5 Agency Consultation

Concurrence with the findings on Parcel A by the Kentucky SHPO were received on July 3, 2025, and on Parcel C on August 1, 2025. The concurrence with the determination of effect and archaeology report was obtained by Four Rivers Nuclear Partnership, in consultation with the SHPO (Martin, 2025a). Additional details of this survey are available in Section 7 of the Phase I Archaeological Reconnaissance for Leasing Parcel A, McCracken County, Kentucky (Martin, 2025a) and Phase I Archaeological Reconnaissance of Parcel 1 at the Paducah Gaseous Diffusion Plant, McCracken County, Kentucky (Martin, 2025b).

3.8.6 Other Comments

Additional details of this survey are available in the Phase I Archaeological Reconnaissance for Leasing Parcel A, McCracken County, Kentucky (Martin, 2025a) and Phase I Archaeological Reconnaissance of Parcel 1 at the Paducah Gaseous Diffusion Plant, McCracken County, Kentucky (Martin, 2025b).

3.8.7 Statement of Site Significance

As described in Martin (2025a), Site 15McN256 is a historic farmstead/residence dating to the late 19th through 20th centuries. The site does not have archaeological integrity and is recommended not eligible for inclusion in the NRHP. No further work is recommended for Site 15McN256 and archaeological clearance is recommended for the project.

3.9 Visual/Scenic Resources

This section describes the visual and scenic characteristics of the GMPEF Site and its vicinity. In addition to using the cited references, the basis for information and conclusions presented include interpretation of applicable maps, spatial data, and photographs.

3.9.1 Viewshed Boundaries

The GMPEF Project Area is located south of the Paducah Site, which consists of existing DOE industrial facilities located in an area zoned MH by McCracken County (NRC, 2026). Lands located to the east, south, and west of the GMPEF Project Area are predominately forested areas previously utilized by the WKWMA. Following recent land transfers, future uses of these areas include industrial uses.

3.9.2 GMPEF Site Photographs

The GMPEF Project Area consists of approximately 107 acres. Tree clearing activities and grading activities have taken place on approximately 70 acres of the approximately 107-acre site as discussed in the CX determination in *Site Preparation Including Tree Clearing (Parcel A) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (CX-270853) and *General Matter, Inc. Site Preparation (Parcel A) at the Paducah Gaseous Diffusion Plant, Kevil, McCracken, Kentucky* (451.1a-093), respectively. The Proposed Action would require tree clearing and grading of 6.8 acres of presently undeveloped forested land. The remaining 30 acres of the GMPEF Site were cleared and graded prior to GeM's lease and are now periodically mowed vegetation areas under the transmission line ROW.

The surrounding vicinity is heavily forested, placing limitations on visibility distances. An aerial photograph of the GMPEF Site and vicinity is shown on Figure 3-27. The developed area to the north of the GMPEF Project Area has several large, multi-story buildings, cylinder storage yards, light towers, and other structures to support the DOE Paducah Site. Key observation points (KOPs) around the GMPEF Site are identified on Figure 3-28. Figure 3-29 through Figure 3-45 present the views of the GMPEF Project Area photographed from different KOPs.



Figure 3-27: Aerial Photograph of the GMPEF Site (Westward View)



Source: GLE (2025)

Figure 3-28: Key Observation Point Map



Figure 3-29: Site Photo from Key Observation Point 1, Facing East



Figure 3-30: Site Photo from Key Observation Point 1, Facing South



Figure 3-31: Site Photo from Key Observation Point 1, Facing North



Figure 3-32: Site Photo from Key Observation Point 2, Facing East



Figure 3-33: Site Photo from Key Observation Point 2, Facing West



Figure 3-34: Site Photo from Key Observation Point 3, Facing East



Figure 3-35: Site Photo from Key Observation Point 3, Facing West



Figure 3-36: Rossington at Massey Road, Facing East



Figure 3-37: S Acid Road at ST-1025, Facing East



Source: Google Maps (2025)

Figure 3-38: Hobbs Road at Gate, Facing North



Source: Google Maps (2025)

Figure 3-39: Woodville Road at Old Hobbs Road, Facing North



Source: Google Maps (2025)

Figure 3-40: Hobbs Road at Woodville Road, Facing North



Source: Google Maps (2025)

Figure 3-41: Woodville Road at Residence, Facing North



Source: Google Maps (2025)

Figure 3-42: Woodville Road at Magruder Road, Facing North



Source: Google Maps (2025)

Figure 3-43: Kelly Road, Facing West



Source: Google Maps (2025)

Figure 3-44: 10035 Crotzer Road, Facing West



Source: Google Maps (2025)

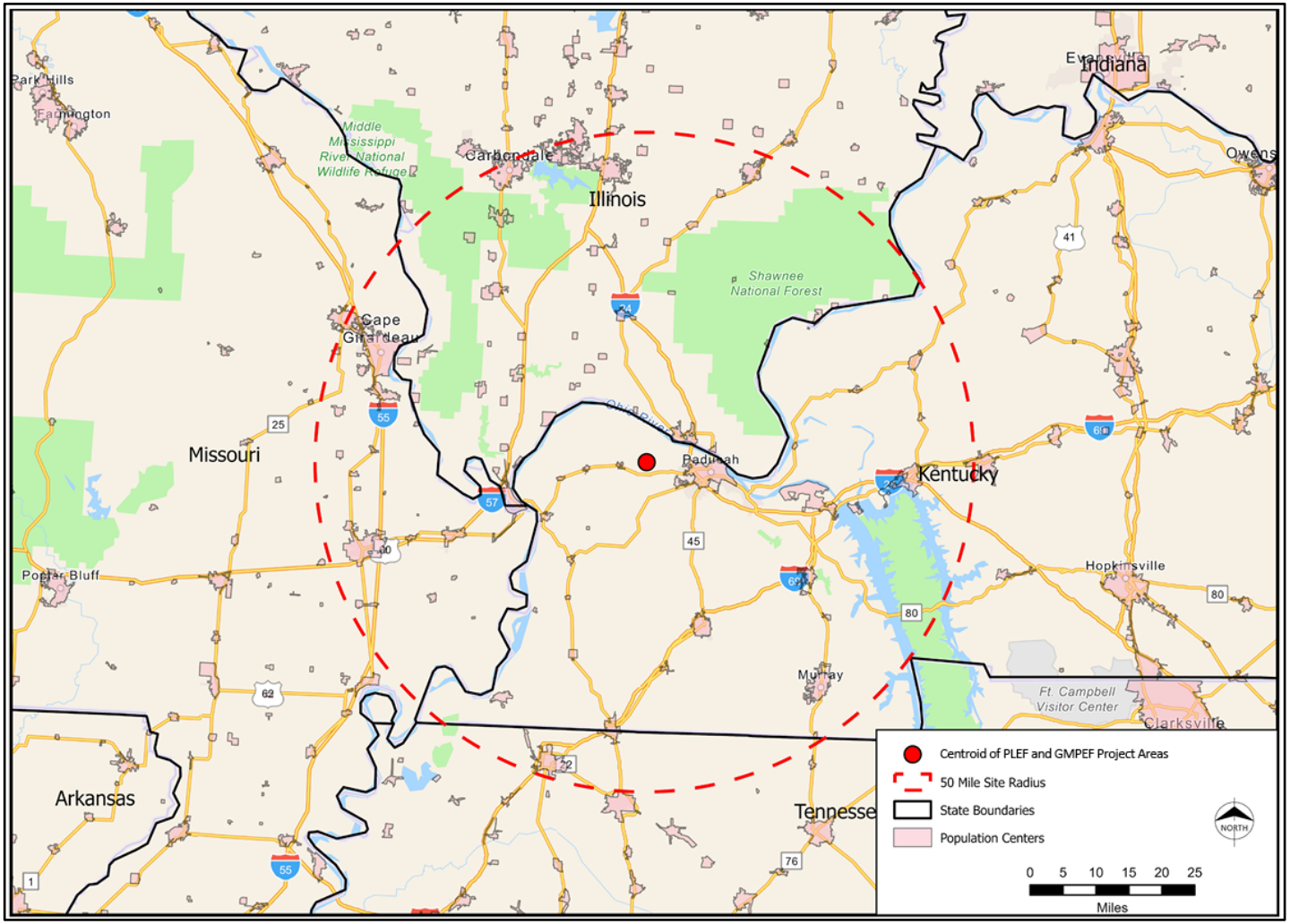
Figure 3-45: Metropolis Lakes Road at Hall Road, Facing West

3.9.3 Residents and Visitors Potentially Affected by Aesthetics Impacts

3.9.3.1 *Affected Residents*

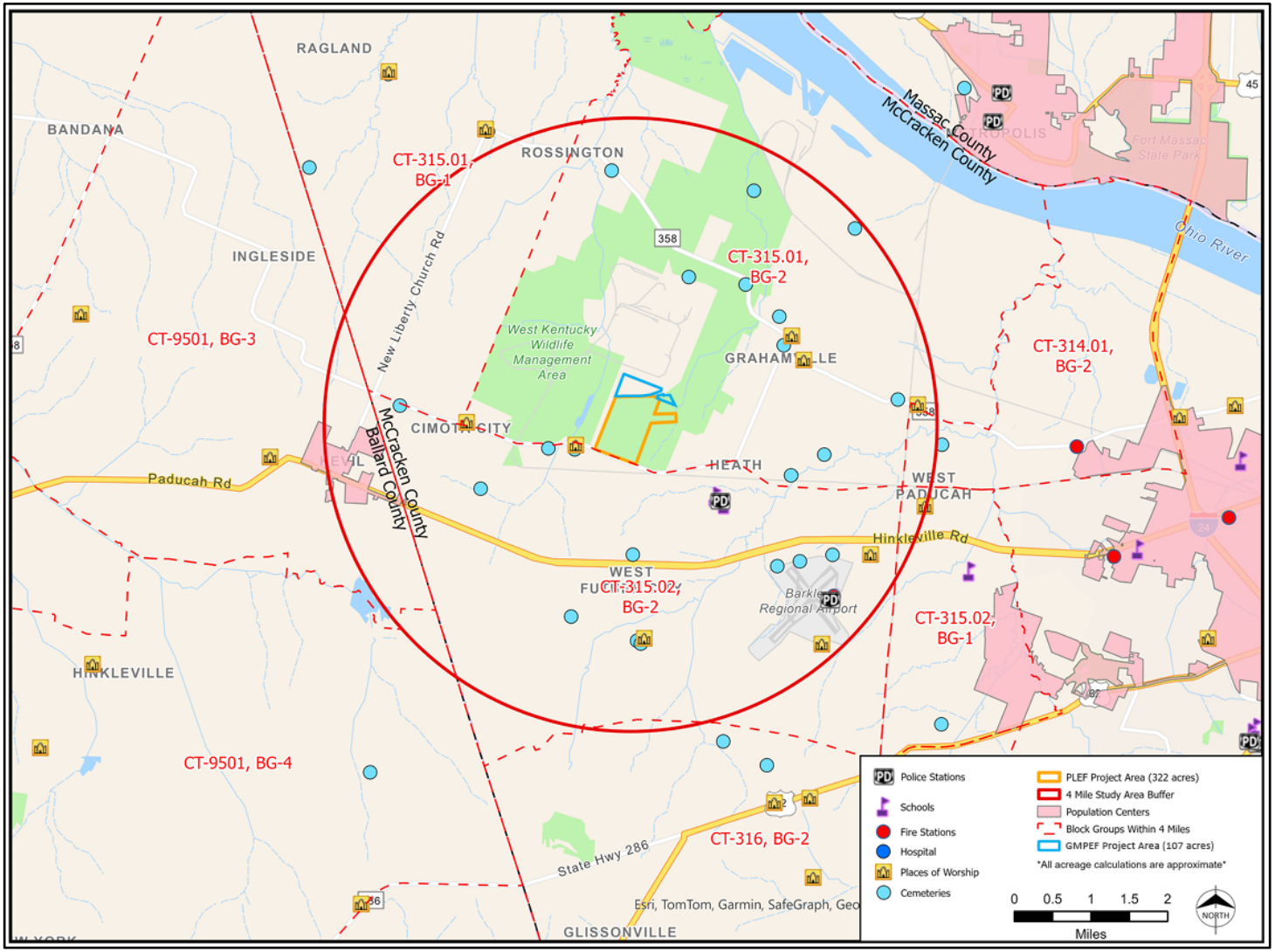
Residents most likely to be affected by aesthetics impacts live in the residential communities in the immediate vicinity of the GMPEF Project Area that are located predominantly to the south and east (see Figure 3-28). The closest residents to the GMPEF Project Area are located approximately 4,300 feet south of the GMPEF Project Area along Woodville Road. Generally, residences located on Woodville Road are single-family homes located on small lots. There are forested areas on the north side of Woodville Road that would shield views of the GMPEF from these residents (see Figure 3-46 and Figure 3-47).

There are residences located approximately 5,600 feet east of the GMPEF on Crotzer Road, but views of the GMPEF from those residences would be shielded by heavily wooded areas. Residences to the west are approximately 1.7 miles away and are shielded by forested areas previously utilized by the WKWMA. Following recent land transfers, future use of previous WKWMA areas would include industrial uses. Potential changes to the topography and therefore, the visual shielding these areas provided for the viewshed are not ripe for analysis at this time. There are no residences located north of the GMPEF that would be affected.



Source: GLE (2025)

Figure 3-46: Population Centers in Ballard and McCracken Counties



Source: GLE (2025)

Figure 3-47: Community Characteristics of the Study Area

3.9.3.2 *Affected Visitors*

Paducah is a designated a United Nations Educational, Scientific, and Cultural Organization Creative City of Crafts and Folk Art for its rich history in quilt making (GLE, 2025; Paducah Convention & Visitors Bureau, 2025; NRC, 2026). Tourism destinations in Paducah and McCracken Counties include the area previously utilized by the WKWMA, National Quilt Museum, Fort Massac State Park, Floodwall Murals, and the Super Museum. Distances from the GMPEF Project Area to major visitor destinations within McCracken and Massac Counties are presented in Table 3-18. For the purposes of calculating these distances, the centroid locations of associated parcel boundaries were used. There are no designated scenic vistas or scenic roadways near the GMPEF Site (NRC, 2026).

Table 3-18: Distance from the PLEF and GMPEF Sites to Selected Visitor Destinations

Destination	County	Distance (miles) [a]
WKWMA[b]	McCracken	2
National Quilt Museum	McCracken	12
Fort Massac State Park	Massac	7
Floodwall Murals	McCracken	12
Super Museum	Massac	6

Source: (GLE, 2025)
Key: GMPEF = General Matter Paducah Enrichment Facility; PLEF = Paducah Laser Enrichment Facility; WKWMA = West Kentucky Wildlife Management Area
Notes:
[a] Distance calculated from the centroid locations of associated parcel boundaries. Rounded to the nearest mile.
[b] Following recent land transfers in 2025 and 2026, future uses of more than 1,200 acres of the WKWMA area would include industrial uses.

3.9.3.3 *Landscape Characteristics*

Detailed descriptions of the landscape characteristics for the GMPEF Project Area and its vicinity, as related to specific features, are presented in the following sections:

- Open spaces and uncultivated land – Section 3.1.3, *Special Land Use Classifications*
- Recreational areas (parks and wilderness areas) – Section 3.1.3, *Special Land Use Classifications*
- Aesthetic features (historical, archaeological, cultural, and natural) that attract tourists – Section 3.1.3, *Special Land Use Classifications*
- Topography – Section 3.3.2.1, *Topography and Physiography*
- Waterbodies – Section 3.4.2, *Surface Waters*
- Ecological environment (flora, fauna, and ecosystems) – Section 3.5, *Ecological Resources*

3.9.4 Location of Constructed Features

The GMPEF Project Area is relatively flat and has been previously developed. Currently, there is a cylinder storage yard in the north central portion of the site, a high voltage transmission line ROW that traverses the site from west to east, and there is a narrow cleared margin along the roads bounding the western, southern, and eastern sides of the site. However, as described in Section 2.1.2.2.1, *Existing Facilities at Proposed Site Location*, other constructed features may exist at the time of subsequent National Environmental Policy Act evaluations.

Tree-clearing activities and grading activities have taken place on approximately 70 acres of the approximately 107-acre site as discussed in the CX determination in *Site Preparation Including Tree Clearing (Parcel A) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (CX-270853) and *General*

Matter, Inc. Site Preparation (Parcel A) at the Paducah Gaseous Diffusion Plant, Kevil, McCracken, Kentucky (451.1a-093), respectively. The Proposed Action would require tree clearing and grading of 6.8 acres of presently undeveloped forested land. The remaining 30 acres of the GMPEF Site were cleared and graded prior to GeM's lease and are now periodically mowed vegetation areas under the transmission line ROW. Both the vegetation and topography of the GMPEF Project Area are typical of other land parcels in McCracken County.

3.9.5 Visibility from Access Roads

The closest primary public road used by automobiles and trucks traveling to and from the GMPEF Project Area is Woodville Road (see Section 3.2, *Transportation*). Because of the distance from the GMPEF Site and the vegetative buffer along this roadway, the GMPEF Site is not visible to drivers along this road (see Figure 3-46 and Figure 3-47). The GMPEF Site is visible from the DOE Paducah Site security access portal on Hobbs Road (see Figure 3-28).

3.9.6 High-Quality View Areas

Except for the cylinder storage yard and the transmission line corridor, the GMPEF Site is forested; and visibility distances are limited. The GMPEF Site is located adjacent and to the east, west, and north of the area previously utilized by the WKWMA, which had public wildlife viewing areas (GLE, 2025; KDFWR, 2025b).

3.9.7 Regulatory Information

Review of the current McCracken County zoning map shows that the area within a 5-mile radius of the GMPEF is primarily zoned residential, agricultural, or heavy industrial (GLE, 2025). Table 3-19 provides a detailed overview of the McCracken County and Paducah zoning designations for the area by acreage and the number of parcels. The GMPEF Site is zoned MH, which is the least restrictive designation possible under the McCracken County Zoning Code. A portion of the 5-mile radius from the GMPEF Project Area falls into Ballard County. Ballard County does not have zoning ordinances (GLE, 2025).

Table 3-19: Zoning Designations for Land Parcels Located in McCracken County Within a 5-Mile Radius of the PLEF and GMPEF Sites

Description	Parcel Count	Total Acres	Acreage Percentage
Agriculture Zone (AG)	1,077	17,132.8	35.4%
Commercial Zone (C)	212	786.3	1.6%
Heavy Industry Zone (MH)	103	12,625.6	26.1%
Mobile Home Park Zone (MHP)	44	40.2	0.1%
Light Industry Zone (ML)	47	1,117.8	2.3%
Rural Residential Zone (RR)	2,651	15,571	32.1%
Urbanizing Residential Zone (UR)	561	1,184.7	2.4%
Planned Office Park (POP)	4	0.4	0.0008%
Total			**100.0**

Sources: (GLE, 2025); Zoning GIS for McCracken County and Paducah (https://mapgis-map-gis.hub.arcgis.com/apps/b74190973f114ae28971566026c5e8b4/explore); Code of Paducah Kentucky Chapter 126 Zoning Article II Zones
Key: % = percent; GMPEF = General Matter Paducah Enrichment Facility; PLEF = Paducah Laser Enrichment Facility

3.9.8 Aesthetic- and Scenic-Quality Rating

The Bureau of Land Management (BLM) developed a Visual Resource Management System to evaluate the aesthetic and scenic quality of public lands in the United States (GLE, 2025; BLM, 1986). This approach has two primary components: inventory and analysis. A modified version of the BLM methodology was used to rate the aesthetic and scenic quality of the GMPEF Site. The analysis component of the BLM

methodology focuses on modifying design characteristics of planned buildings and supporting infrastructure (e.g., utility lines, roads) to minimize the contrast between natural and disturbed areas of the landscape. The inventory component involves assigning the visual resources of an area to an inventory class based on its visual appeal, public concern, and visibility from travel routes and KOPs (GLE, 2025). For this affected environment section, only the inventory component of the BLM Visual Resource Management System was used.

3.9.8.1 *Scenic-Quality Evaluation*

Scenic quality is a measure of the visual appeal of a tract of land. In the BLM's visual resource inventory process, lands are designated as either scenic-quality rating A, B, or C based on the apparent scenic quality as assessed using seven key factors: landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications (GLE, 2025; BLM, 1986). Table 3-20 presents the BLM's explanation of the seven key factors used to assess the scenic-quality rating for a tract of land. For a given tract of land, a score is assigned for each of the seven key factors using the BLM's scoring criteria present in Table 3-21. The total score, obtained by summing the individual scores for the seven key factors, is then used to apply a scenic-quality rating for a site using the following BLM rating designations: A = total score of 19 or more, B = total score 12 to 18, and C = total score 11 or less.

Table 3-20: BLM Scenic-Quality Evaluation Key Factor Explanation

Key Factor	Explanation
Landform	Topography becomes more interesting as it gets steeper or more massive, or more severely or universally sculptured. Outstanding landforms may be monumental, such as the Grand Canyon, the Sawtooth Mountain Range in Idaho, or the Wrangell Mountain Range in Alaska, or they may be exceedingly artistic and subtle, such as certain badlands, pinnacles, arches, and other extraordinary formations
Vegetation	Give primary consideration to the variety of patterns, forms, and textures created by plant life. Consider short-lived displays when they are known to be recurring or spectacular. Consider also smaller-scale vegetation features, which add striking and intriguing detail elements to the landscape (e.g., gnarled or wind beaten trees, Joshua trees).
Water	The ingredient that adds movement or serenity to a scene. The degree to which water dominates the scene is the primary consideration in selecting the rating score.
Color	Consider the overall color(s) of the basic components of the landscape (e.g., soil, rock, vegetation) as they appear during seasons or periods of high use. Key factors to use when rating "color" are variety, contrast, and harmony.
Adjacent Scenery	The degree to which scenery outside the scenery unit being rated enhances the overall impression of the scenery within the rating unit. The distance that adjacent scenery will influence scenery within the rating unit will normally range from 0–5 miles, depending on the characteristics of the topography, the vegetative cover, and other such factors. This factor is generally applied to units that would normally rate very low in score, but the influence of the adjacent unit would enhance the visual quality and raise the score.
Scarcity	This factor provides an opportunity to give added importance to one or all of the scenic features that appear to be relatively unique or rare within one physiographic region. There may also be cases where a separate evaluation of each of the key factors does not give a true picture of the overall scenic quality of an area. Often it is a number of not so spectacular elements in the proper combination that produces the most pleasing and memorable scenery. The scarcity factor can be used to recognize this type of area and give it the added emphasis it needs.
Cultural Modifications	Cultural modifications in the landform/water, vegetation, and addition of structures should be considered and may detract from the scenery in the form of a negative intrusion or complement or improve the scenic quality of a unit. Rate accordingly.

Sources: (GLE, 2025; BLM, 1986)

Table 3-21: Scenic-Quality Inventory Evaluation and Scoring for the GMPEF Site

Key Factor	BLM Scenic Quality Evaluation Scoring Criteria [a]			Evaluation and Assigned Score for the GMPEF Site
Landform	High vertical relief as expressed in prominent cliffs, spires, or massive rock outcrops, or severe surface variation or highly eroded formations, including major badlands or dune systems; or detail features dominant and exceptionally striking and intriguing, such as glaciers. (5)	Steep canyons, mesas, buttes, cinder cones, and drumlins; interesting erosional patterns or variety in size and shape of landforms; detail features that are interesting, though not dominant or exceptional. (3)	Low rolling hills, foothills, or flat valley bottoms; or few or no interesting landscape features. (1)	The GMPEF Site contains a few minor topographic changes. No landform features are present on site. Landform Score = 1
Vegetation	A variety of vegetative types as expressed in interesting forms, textures, and patterns. (5)	Some variety of vegetation, but only one or two major types. (3)	Little or no variety or contrast in vegetation. (1)	The GMPEF Site is heavily cleared. The remaining presently undeveloped forest area (6.8 acres) contains a canopy consisting of various oaks including red oak, black oak, pin oak, swamp white oak, overcup oak, as well as red maple, mockernut hickory, black walnut, common hackberry, and green ash. Vegetation Score = 3
Water	Clear and clean appearing, still, or cascading white water, any of which are a dominant factor in the landscape. (5)	Either flowing, or still, but not dominant in the landscape. (3)	Either absent, or present, but not noticeable. (0)	The GMPEF Project Area contains no significant water bodies. Water Score = 0
Color	Rich color combinations, variety or vivid color; or pleasing contrasts in the soil, rock, vegetation, water or snow fields. (5)	Some intensity or variety in colors and contrast of the soil, rock and vegetation, but not a dominant scenic element. (3)	Subtle color variations, contrast, or interest; generally mute tones. (1)	Green foliage and reddish-brown soil dominate. Color Score = 1
Adjacent Scenery	Adjacent scenery greatly enhances visual quality. (5)	Adjacent scenery moderately enhances overall visual quality. (3)	Adjacent scenery has little or no influence on overall visual quality. (0)	Areas adjacent to the GMPEF Site to the west, east, and south are generally undeveloped, forested and agricultural land.

Table 3-21: Scenic-Quality Inventory Evaluation and Scoring for the GMPEF Site

Key Factor	BLM Scenic Quality Evaluation Scoring Criteria [a]			Evaluation and Assigned Score for the GMPEF Site
				Areas to the north of the Site are developed with industrial facilities from the DOE Paducah Site. Adjacent Scenery Score = 0
Scarcity	One of a kind; or unusually memorable, or very rare within a region. Consistent chance for exceptional wildlife or wildflower viewing. (5)	Distinctive, though somewhat similar to others within the region. (3)	Interesting within its setting, but fairly common within the region. (1)	Vegetation and scenery in the Site are common and typical of surrounding land parcels. Scarcity Score = 1
Cultural Modifications	Modifications add favorably to visual variety while promoting visual harmony. (2)	Modifications add little or no visual variety to the area and introduce no discordant elements. (0)	Modifications add variety but are very discordant and promote strong disharmony. (-4)	A cylinder storage yard and high voltage power lines are present. Trees have been cleared from approximately 70 acres of the site, trees were previously cleared prior to GeM's lease and are now maintained vegetation areas for 30 acres of the site (underneath transmission lines), and approximately 6.8 acres of presently undeveloped forest remain. Cultural Modification Score = 0
				Total Key Factor Score = 6

Sources: (GLE, 2025; BLM, 1986)
Key: BLM = Bureau of Land Management; DOE = United States Department of Energy; GMPEF = General Matter Paducah Enrichment Facility
Note:
[a] The BLM Scenic-Quality Inventory protocol allows for assigning a score at any integer value within the maximum and minimum score range listed for an individual key factor.

For the purposes of the scenic-quality evaluation, a single scenic-quality rating unit is considered in evaluating the GMPEF Site. The results of the scenic-quality evaluation are presented in Table 3-21, with the assessed area assigned a total scenic quality score of 6, which places the GMPEF Site within the lowest BLM scenic quality rating of C.

3.9.8.2 *Sensitivity-Level Analysis*

The sensitivity-level analysis portion of the BLM methodology is designed for use on public lands. The GMPEF Site would be leased to a private company; therefore, a large part of the sensitivity analysis is not directly transferable. However, key considerations identified by the BLM about sensitivity level include type of users, amount of use, public interest, adjacent land uses, and special areas.

3.9.8.3 *Distance-Zones Delineation*

The BLM methodology also includes an assessment of the visibility of the area from travel routes and KOPs. The following three distance zones are identified: foreground-middleground, background, and seldom seen. The foreground-middleground zone typically includes areas visible from 3 to 5 miles away; the background zone includes areas visible from 6 to 15 miles away; and the seldom-seen zone includes areas not visible from travel routes. Visibility is severely limited in and around the GMPEF Project Area by trees and other vegetation; therefore, the full BLM distance-zones delineation is not applicable.

The 71-foot-tall uranium enrichment buildings will be the tallest onsite structure, and it will have 9 stacks with a maximum height of approximately 72 feet. The building and stacks would be visible from Hobbs Road and Dyke Road. The building would not likely be visible from any of the surrounding residences or from further distances due to the flat topography and extent of vegetative buffers.

3.9.8.4 *Determination of Visual Resource Inventory Classes*

The BLM provides a framework for integrating the results of scenic-quality evaluation, sensitivity-level analysis, and distance-zones delineation. The scenic-quality rating of C and the low sensitivity rating place the GMPEF Site within Visual Resource Inventory Class IV for all three distance zones. Of the four visual resource inventory classes, Class IV allows for the greatest degree of landscape modification and is considered to have the least visual and scenic value. The level of change to the landscape can be high and management activities can dominate the view; however, attempts will be made to minimize the effect of the planned disturbance.

3.10 Socioeconomic Environment

This section studies the population, economic, and community characteristics of the region surrounding the GMPEF Site. For the majority of this section, this region will be defined as the two counties, McCracken and Ballard that are most likely to incur economic, labor force, and infrastructure impacts due to the Proposed Action. The data used in this section represent relatively current conditions in the region (for example, 2022), or projected conditions during the expected life of the GMPEF. In some cases, such as detailed demographic data for small geographic areas (for example, Census Block Groups [CBGs]), the most current and complete data available are from the 2020 Census.

3.10.1 Population Characteristics

3.10.1.1 *Population and Projected Growth*

As described in the PLEF Draft EIS (NRC, 2026), in recent years, both Ballard and McCracken Counties have grown less rapidly than other counties in Kentucky. Ballard County has experienced a population decline since 2000, losing 398 people or 4.9 percent of the county's population between 2000 and 2020. In contrast, McCracken County grew by 3,695 people or 5.67 percent from 2000–2020, while the State experienced 14.74 percent growth over the same time period (see Table 3-22). Between 2000 and 2010,

the combined population of the region grew by 0.27 percent compared to 7.3 percent growth across the State. Between 2010 and 2020, the combined population of the region grew by 4.28 percent compared to 6.94 percent for the State (NRC, 2026).

Table 3-22: Population in Region (2000 to 2020)

County	2000	2010	2020	Percent Change, 2000–2010	Percent Change, 2010–2020	Percent Change, 2000–2020
McCracken	64,180	64,376	67,875	0.31%	5.44%	5.76%
Ballard	8,126	8,122	7,728	-0.05%	-4.85%	-4.90%
Two-County Total	72,306	72,498	75,603	0.27%	4.28%	4.56%
Kentucky	3,926,965	4,213,497	4,505,836	7.30%	6.94%	14.74%

Sources: GLE (2025) from 2020 U.S. Census Bureau data
Key: % = percent; - = minus

According to the U.S. Census Bureau, the population of the State is projected to increase by 4.26 percent between 2030 and 2040 and by 3.63 percent between 2040 and 2050, while both Ballard and McCracken Counties are expected to experience declining populations between 2030 and 2050. Ballard County is forecasted to lose 7.61 percent of its 2030 population by 2050; while McCracken County is forecasted to lose 4.72 percent of its 2030 population by 2050 (see Table 3-23). The Kentucky State Data Center projects similar growth for the State from 2030 to 2050 (3 percent) and a decline in population for Ballard County from 2030 to 2050 (16.7 percent). In contrast, the Kentucky State Data Center forecasts a population growth of McCracken County of 3.3 percent from 2030 to 2050 (GLE, 2025; KSDC, 2022).

Table 3-23: Population Projections for Region

County	2030	2040	2050	Percent, Change, 2030–2040	Percent Change, 2040–2050	Percent Change, 2030–2050
McCracken	66,567	65,105	63,428	-2.20%	-2.58%	-4.72%
Ballard	8,073	7,770	7,459	-3.75%	-2.84%	-7.61%
Two-County Total	74,640	72,875	70,887	-2.36%	-2.73%	-5.03%
Kentucky	4,951,178	5,162,282	5,349,720	4.26%	3.63%	8.05%

Sources: GLE (2025) from 2020 U.S. Census Bureau data
Key: % = percent; - = minus

Paducah is the county seat of McCracken County with an estimated 2023 population of 67,428. Hendron, with a population of 5,112 in 2022, is the second-largest city in the county (GLE, 2025). In Ballard County, Wickliffe, with a population of 658 in 2022, is the county seat. LaCenter is Ballard County's largest city with a population of 867 in 2022 (GLE, 2025). Figure 3-48 shows population centers within the region.

3.10.1.2 *Population Density*

Population density varies widely between the two counties that comprise the region of interest for the GMPEF Site. In 2020, Ballard County had a relatively low population density, with less than 29 people per square mile, whereas McCracken County was much more densely populated, with more than 253 people per square mile (see Table 3-24). Figure 3-48 shows the population density by CBG. Within each county, there are CBGs with relatively dense populations and other areas that are sparsely populated. For example, in McCracken County, there are some CBGs with population densities above 600 people per square mile, whereas in the rural areas of both counties, there are areas with fewer than 200 people per square mile. In 2020, the CBG within which the GMPEF is to be located (CT 315.01, CBG 2) had a population density of 200 residents per square mile. By 2050, McCracken County's population density is projected to approach 270 people per square mile (compared to a projected density for Kentucky of approximately 118 people per square mile) and Ballard County's population density is projected to decline to 22 people per square mile (GLE, 2025).

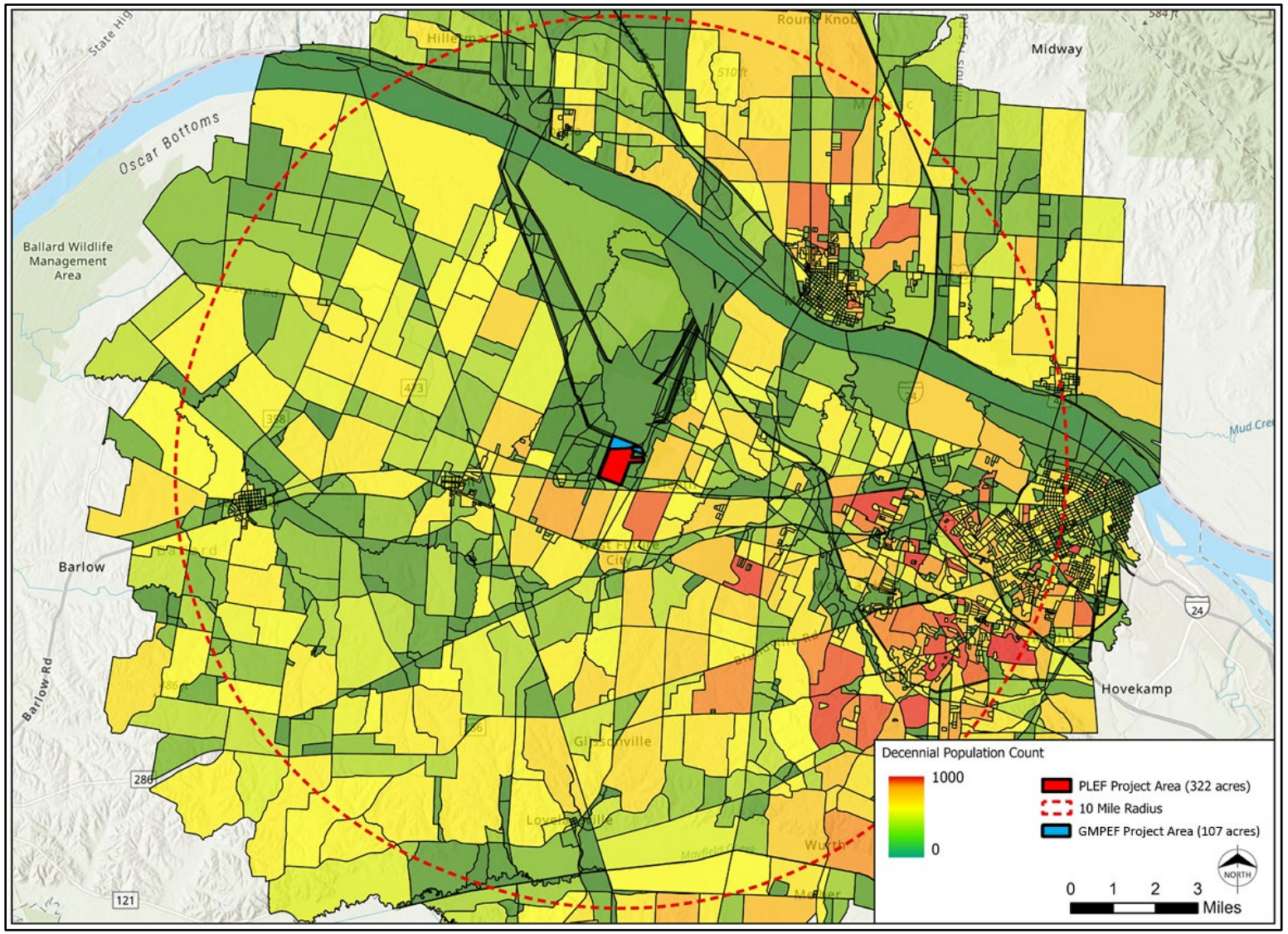


Figure 3-48: Population by CBG within 10 Miles of the PLEF and GMPEF Sites (adapted from GLE 2025)

Table 3-24: Population Density in Region (2020)

County	Total 2020 Population	Total 2050 Population	Land Area (square miles)	Population per Square Mile (2020)	Population per Square Mile (2050)
Ballard County	7,728	5,979	274	28.20	21.82
McCracken County	67,875	71,761	268	253.26	267.76
Two-County Total	75,603	77,740	542	139.49	143.43

Sources: GLE (2025) from 2020 U.S. Census Bureau data and KSDC (2022)

3.10.2 Economic Characteristics

3.10.2.1 *Employment and Occupational Patterns*

According to the American Community Survey (ACS) 5-Year Estimates, the total labor force between Ballard and McCracken Counties included 34,522 individuals (GLE, 2025). This labor force was classified into three categories: labor force in the Armed Forces (22), employed civilian labor force (33,212), and unemployed civilian labor force (1,288) (GLE, 2025). Table 3-25 reports each of these regional labor force statistics by county.

Table 3-25: Employment Characteristics of Region (2020)

County	Total Labor Force	Labor Force in Armed Forces	Employed Civilian Labor Force	Unemployed Labor Force	Percent Unemployed Labor Force [a]
McCracken	3432	5	3,248	179	5.22%
Ballard	31,090	17	29,964	1,109	3.57%
Two-County Total	34,522	22	33,212	1,288	8.78%

Sources: GLE (2025) from 2020 U.S. Census Bureau data
Key: % = percent
Note:
[a] Percent Unemployed Labor Force is calculated by dividing the number of unemployed workers in each county by the total labor force in that county.

The ACS 5-Year Estimates also provide data on the distribution of civilian employment across industries (GLE, 2025). These data are reported in Table 3-26 for the region. The regional distribution of employment by industry in Ballard and McCracken Counties is generally similar to the distribution of employment in the State as a whole; however, there are several key differences (GLE, 2025). Ballard County has a smaller portion of workers employed in retail trades compared to McCracken County and the State. McCracken County has a smaller portion of workers employed in manufacturing compared to Ballard County and the State. Instead, a greater portion of workers are employed in construction and in the arts, entertainment, recreation, and accommodation and food sectors for Ballard and McCracken Counties, respectively. Between the two counties, education, health, and social services represent the largest employers of this region (NRC, 2026).

Table 3-26: Employment by Industry in Region (2020)

Industry	Ballard Country		McCracken County		Two-County Total		Kentucky	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Agriculture, forestry, fishing and hunting, and mining	138	4.25%	227	0.76%	365	1.10%	37,396	1.85%
Construction	352	10.84%	1,570	5.24%	1,922	5.79%	125,130	6.18%
Manufacturing	387	11.92%	2,622	8.75%	3,009	9.06%	287,839	14.21%
Wholesale trade	90	2.77%	534	1.78%	624	1.88%	46,590	2.30%
Retail trade	298	9.17%	4,445	14.83%	4,743	14.28%	238,919	11.80%
Transportation and warehousing, and utilities	300	9.24%	1,576	5.26%	1876	5.65%	137,984	6.81%
Information	3	0.09%	661	2.21%	664	2.00%	27,981	1.38%
Finance, insurance, real estate, and rental and leasing	87	2.68%	1,613	5.38%	1,700	5.12%	113,009	5.58%
Professional, scientific, management, administrative, and waste management services	263	8.10%	2,847	9.50%	3,110	9.36%	181,957	8.98%
Educational, health and social services	781	24.05%	7,439	24.83%	8,220	24.75%	485,797	23.99%
Arts, entertainment, recreation, accommodation and food services	245	7.54%	3,190	10.65%	3,435	10.34%	164,384	8.12%
Other services (except public administration)	235	7.24%	1,693	5.65%	1,928	5.81%	91,647	4.52%
Public administration	69	2.12%	1,547	5.16%	1,616	4.87%	86,763	4.28%
Total	**3,248**	**100%**	**29,964**	**100%**	**33,212**	**100%**	**2,025,396**	**100%**

Sources: GLE (2025) from 2020 U.S. Census Bureau data
Key: % = percent

3.10.2.2 *Income*

Table 3-27 reports per-capita income and median household income for the region relative to Kentucky from the ACS 5-Year Estimates (GLE, 2025). These statistics are two measures of the "typical" income received by residents of each county. The difference between these two statistics is that per-capita income is estimated by dividing the total income generated in each county by the total county population, whereas median household income divides households into two equal segments, with the first half of households earning less than the median household income and the other half earning more (GLE, 2025; U.S. Census Bureau, 2023).

Table 3-27: Income Data for Region

	Ballard County	McCracken County	Kentucky
Per capita income in 2020	$31,315	$36,401	$33,515
Percent of State per capita income	93%	109%	100%
Median household income in 2020	$57,111	$58,490	$60,183
Percent of State median household income	95%	97%	100%

Sources: GLE (2025) from 2020 U.S. Census Bureau data
Key: $ = United States dollar; % = percent

Per-capita income (2022) in the region ranged from $31,315 in Ballard County to $36,401 in McCracken County. These values are relatively close to the per-capita income in Kentucky as a whole ($33,515). Per-capita income in Ballard County is 6 percent below State per-capita income and McCracken County's per-capita income is 8 percent greater than State per-capita income. The 2022 median household income was $57,111 in Ballard County, $58,490 in McCracken County, and $60,183 in Kentucky (GLE, 2025; U.S. Census Bureau, 2022a).

To provide a better understanding of which industries are generating the income received by households, Table 3-28 reports sales received by each industry in 2017 by county. The data reported in this table were compiled from two separate sources: sales for the agricultural sector from the 2017 Census of Agriculture (GLE, 2025; USDA, 2019), and all other revenue data from the 2017 Economic Census (GLE, 2025; U.S. Census Bureau, 2017).

The Economic Census does not disclose sales information for all industries in all counties to avoid disclosing data for individual companies (GLE, 2025; U.S. Census Bureau, 2017); however, these data are included at higher levels of geographical aggregation. Therefore, to account for this fact, sales data for the Paducah Kentucky-Illinois Metropolitan Statistical Area (MSA) are included in Table 3-28. An MSA is a geographic entity defined by the Office of Management and Budget for the use of compiling and reporting Federal statistics. An MSA contains a core urban area with a population of 50,000 or more. Each MSA consists of one or more counties and includes the counties containing the core urban area as well as any adjacent counties that have a high degree of social and economic integration (as measured by commuting to work) with the urban core. The Paducah MSA's urban core is Paducah and includes the whole of five counties: Ballard, Carlisle, Livingston, and McCracken Counties in Kentucky and Massac County in Illinois (GLE, 2025; OMB, 2023).

Table 3-28: Measures of Economic Output by Sector for Counties in the Region (2020)

NAICS[a]	Description	Units ($1,000)	Ballard County, Kentucky	McCracken County, Kentucky	Two-County Total	Paducah, Kentucky Metropolitan Statistical Area
11	Agriculture	Sales	70,613	28,923	99,536	N/A
31–33	Manufacturing	Total value of shipments	D	547,351	547,351	787,381
42	Wholesale Trade	Sales	D	4,324,456	4,324,456	5,286,119
44–45	Retail Trade	Sales	40,561	1,715,578	1,756,139	1,899,697
51	Information	Receipts	N/A	N/A	D	N/A
53	Real Estate and Rental and Leasing	Revenue	D	90,464	90,464	107,478
54	Professional, Scientific, and Technical Services	Receipts	22,143	145,288	167,431	199,361
56	Administrative and Support and Waste Management and Remediation Services	Receipts	9,244	121,559	130,803	135,199
61	Education Services	Receipts	N/A	1,041	1,041	3,391
62	Health Care and Social Assistance	Receipts	D	920,633	920,633	1,023,019
71	Arts, Entertainment, and Recreation	Receipts	N/A	16,815	16,815	20,483
72	Accommodation and Food Services	Sales	D	218,225	218,225	334,174
81	Other Services (except Public Administration)	Receipts	D	113,680	113,680	126,672
Total			142,561	8,244,013	8,386,574	9,922,974

Sources: GLE (2025) from 2020 U.S. Census Bureau, and 2019 USDA data
Key: $ = United States dollar; D = withheld by the United States Census Bureau to avoid disclosing data for individual companies; N/A = not available or not comparable; NAICS = North American Industry Classification System
Note:
[a] NAICS (http://www.census.gov/epcd/www/naics html)

3.10.2.3 *Tax Structure*

Taxes on real estate (e.g., land and buildings) and personal property (e.g., boats, automobiles, and all machinery and equipment) are the principal sources of local revenue. The taxes applied are a composite of State, county, and municipal levies (GLE, 2025). There are a few tax exemptions and exclusions. Among these exemptions, government-owned properties are exempt from taxation in Kentucky. Nuclear materials held for the purpose of, or in the process of, manufacture or processing, or held by the manufacturer for delivery are also exempt from taxation (GLE, 2025; KYDOR, 2017).

In 2023, Kentucky had statewide single flat income tax of 4 percent (KYDOR, 2025a). The corporate income tax rate was 5 percent (KYDOR, 2025b) and the statewide sales and use tax rate was 6 percent (KYDOR, 2025c). Kentucky does not impose additional sales taxes at the city or county level (GLE, 2025; KYDOR, 2025c).

Table 3-29 provides county-wide tax rates for the region, as well as the ranges of tax rates for municipalities within Ballard and McCracken Counties. The tax rates for Ballard and McCracken Counties are significantly higher than the State average. The tax rate for property outside of the Paducah city limits is $0.89 per $100 of assessed value (GLE, 2025).

Table 3-29: Property Tax Rates in the Region (Fiscal Year 2022 to 2023)

County	County Property Tax Rate ($/$100 of value)	Range of Tax Rates for Municipalities inside County ($/$100 of value)
Ballard County	0.36	0.00 to 0.55
McCracken County	0.25	0.00 to 0.86

Source: GLE (2025)
Key: $ = United States dollar

3.10.3 Community Characteristics

As described in the PLEF ER (GLE, 2025), this section discusses various characteristics of the communities located in the region. These characteristics include housing, education, health care, public safety, and transportation. A graphical illustration of the location of facilities offering services related to these characteristics is provided on Figure 3-47.

3.10.3.1 *Housing*

Table 3-30 presents regional housing characteristics by county based on the 2020 Census. In 2020, Ballard and McCracken Counties had a total of nearly 36,000 housing units, with the majority of these located in McCracken County (GLE, 2025). The vast majority of housing units in the region are single-family structures, but the number of multi-family structures is increasing as the region develops. The region's housing is roughly two-thirds urban, with much of the urban housing located in McCracken County, which had 75 percent urban housing units. Occupancy was 90 percent in McCracken County and 88 percent in Ballard County, which had approximately 4,000 seasonal, recreational, or occasional-use units standing vacant between the two counties at the time of the Census (GLE, 2025).

Table 3-30: Housing Characteristics in the Region (2020)

	McCracken County	Ballard County	Two-County Total
Total	32,040	3,684	35,724
Urban	23,926	0	23,926
Percent Urban	75%	0%	-
Rural	8,114	3,684	11,798

Table 3-30: Housing Characteristics in the Region (2020)

	McCracken County	Ballard County	Two-County Total
Percent Rural	25%	100%	-
Occupied	28,932	3,228	32,160
Owner occupied	18,411	2,517	20,928
Renter occupied	10,521	711	11,232
Vacant	3,108	456	3,564
For rent	937	97	1,034
For sale only	408	53	461
Rented or sold, not occupied	480	19	499
For seasonal, recreational, or occasional use	221	36	257
For migrant workers	1	1	2
Other vacant	1,224	251	1,475

Sources: GLE (2025) from 2020 and 2022 U.S. Census Bureau data
Key: $ = United States dollar; % = percent

Table 3-31 shows estimated housing values for owner-occupied units in the region. McCracken County has the highest housing values, with a median value of $172,300, and approximately 700 units (7.7 percent of owner-occupied units in the county) valued above $500,000 (GLE, 2025). By contrast, Ballard County had a total of nearly 126 units (5 percent of owner occupied units in the county) valued above $500,000 with roughly 20 percent of homes valued at less than $50,000. Approximately 50 percent of owner-occupied homes in Ballard County were valued at less than $100,000 in 2022, compared to 22 percent in McCracken County (GLE, 2025).

Table 3-31: Value of All Owner-Occupied Housing Units in the Region (2020)

Total	Number of Units		
	McCracken County	Ballard County	Region Total
Less than $50,000	542	52	594
$50,000 to $99,999	1,556	363	1,919
$100,000 to $299,999	5,661	524	6,185
$300,000 to $499,999	1,062	111	1,173
Over $500,000	732	19	751
Total Owner-Occupied Units	9,553	1,069	10,622
Median Value			
Median Value for all Owner-Occupied Housing Units	$178,300	$148,200	

Sources: GLE (2025) from 2020 U.S. Census Bureau data
Key: $ = United States dollar; % = percent

As described in Section 3.10.1, *Population Characteristics*, both Ballard and McCracken Counties have grown less rapidly than other counties in the State, with Ballard County seeing a decline in population (GLE, 2025). This continuing trend is illustrated in the number of building permits for new, privately owned residential buildings, shown in Table 3-32. Over the period of 2015–2021, the annual number of building permits in McCracken County declined by nearly 75 percent. From 2015 to 2016, the county experienced a decline in the number of building permits of nearly 50 percent. The county continued to experience a general decline through 2020, with slight increases occurring from 2018 to 2019 and from 2020 to 2021 (GLE, 2025; U.S. Census Bureau, 2022b).

Table 3-32: Privately Owned Residential Building Permits in the Region [a]

Year	McCracken County	Ballard County
	Buildings	Units
2015	487	1,469
2016	239	150
2017	129	76
2018	113	60
2019	135	120
2020	116	20
2021	134	194

Sources: GLE (2025) from U.S. Census Bureau data
Note:
[a] Represents new buildings or units per month.

3.10.3.2 *Education*

As it relates to schools, there are several school districts within the two-county region. These include Ballard County School District, Paducah Independent School District, and McCracken County School District (GLE, 2025; NCES, 2023a). The McCracken County School District consists of 14 total schools and 6,968 students, which serve all areas in the county except for the city limits of Paducah (GLE, 2025; NCES, 2023a). The Paducah Independent School District serves the area within the city limits of Paducah and has a total of 7 schools serving 3,119 total students (GLE, 2025; NCES, 2023b). Ballard County School district serves 1,052 total students between 5 schools (GLE, 2025; NCES, 2023c).

There are a total of 16 public and private elementary, middle, and high schools in the region. In addition to these primary and secondary schools, colleges such as the University of Kentucky – Paducah Campus, West Kentucky Community and Technical College, and Murray State University – Paducah Campus are located in the region. Table 3-33 provides a summary of school data and an estimate of the number of individuals attending these schools by grade level can be found in Table 3-34. These data reflect enrollment in 2022; however, it can be assumed that enrollment has decreased in both counties because of the population decline experienced since 2020.

Table 3-33: Number of Schools in the Region by Type

County	Elementary	Middle	Secondary	Combined	Post Secondary
McCracken	8	4	2	1	5
Ballard	0	0	1	0	0
Total	8	4	3	1	5

Source: (GLE, 2025)

Table 3-34: Enrollment by Level of School in the Region (2020)

Level of School	McCracken County	Ballard County
Enrolled in nursery school, preschool	1,384	74
Enrolled in kindergarten	719	85
Enrolled in grade 1 to grade 4	3,103	480
Enrolled in grade 5 to grade 8	3,178	277
Enrolled in grade 9 to grade 12	3,436	418
Enrolled in college, undergraduate years	2,478	259
Enrolled in graduate or professional school	315	39
Total	**14,613**	**1,632**

Sources: GLE (2025) from 2020 U.S. Census Bureau data

Out of the 16 schools in the region, only 2 are within a 4-mile radius of the GMPEF (Heath Elementary School and Heath Middle School) (GLE, 2025). Table 3-35 details the location and enrollment of these schools during the 2022–2023 school year. Figure 3-47 graphically illustrates the location of these schools, as well as other schools in the region.

Table 3-35: Educational Facilities in the Vicinity of the PLEF and GMPEF Sites

Name	Type	Public or Private	Distance (miles)	Total Students	Teachers (FTEs)	Student to Teacher Ratio
Heath Elementary School	Elementary	Public	1.45	438	30	14
Heath Middle School	Middle	Public	1.58	414	28	15
McCracken County High School	Secondary	Public	4.83	1,991	107	18
Concord Elementary School	Elementary	Public	6.81	609	36	15

Sources: GLE (2025) from Kentucky Department of Education website data
Key: FTE = Full-Time Equivalent Employee (part-time workers are reported as a fraction of one full-time worker); GMPEF = General Matter Paducah Enrichment Facility; N/A = not available; PLEF = Paducah Laser Enrichment Facility

According to the 2022 ACS 5-Year Estimates (GLE, 2025), the population of McCracken County appears to have more formal education than the State because 32 percent of the population in this county had received a bachelor's degree or higher. On the other hand, the population of Ballard County had less advanced education than the State. Approximately 28 percent of individuals living in Kentucky had received a bachelor's or more advanced degree, whereas only 17 percent of individuals in Ballard County had received similar degrees (see Table 3-36) (GLE, 2025; U.S. Census Bureau, 2022b).

Table 3-36: Level of Educational Attainment in the Region (2020)

Level Attained	McCracken County		Ballard County		Kentucky	
	Number	% of Total	Number	% of Total	Number	% of Total
No schooling completed	327	0.69	26	0.47	36,539	1.19
Nursery to 4th grade	34	0.07	0	0.00	9,558	0.31
5th and 6th grade	112	0.24	44	0.79	18,076	0.59
7th and 8th grade	502	1.06	81	1.46	74,856	2.44
9th grade	484	1.02	72	1.30	51,118	1.67
10th grade	722	1.52	73	1.31	64,934	2.12
11th grade	909	1.92	47	0.85	60,322	1.97
12th grade, no diploma	364	0.77	95	1.71	47,234	1.54
High school graduate (includes equivalency)	14,991	31.59	2,256	40.58	1,003,270	32.71
Some college, less than 1 year	3,797	8.00	351	6.31	210,743	6.87
Some college, 1 or more years, no degree	6,907	14.55	717	12.90	408,299	13.31
Associate degree	4,928	10.38	833	14.98	269,411	8.78
Bachelor's degree	7,917	16.68	653	11.75	478,134	15.59
Master's degree	3,945	8.31	272	4.89	241,185	7.86
Professional school degree	990	2.09	11	0.20	56,939	1.86

Table 3-36: Level of Educational Attainment in the Region (2020)

Level Attained	McCracken County		Ballard County		Kentucky	
	Number	% of Total	Number	% of Total	Number	% of Total
Doctorate degree	531	1.12	28	0.50	35,681	1.16
Total	47,460	100	5,559	100	3,067,109	100

Sources: GLE (2025) from 2020 U.S. Census Bureau data
Key: % = percent

3.10.3.3 *Health Care, Public Safety, and Transportation Services*

3.10.3.3.1 Health Care

As shown in Table 3-37, health care in the region is provided by several hospitals, primary care centers, and specialty care centers (GLE, 2025). The Baptist Health Hospital and the Mercy Health–Lourdes Hospital in Paducah serve as regional medical and referral centers for more than a dozen counties in Western Kentucky, Southern Illinois, Southeast Missouri, and Northwest Tennessee. The Baptist Health Hospital in Paducah is a large regional medical center with over 350 beds, and offers a variety of services, including specialized surgery with 15 operating rooms; advanced cardiac and cancer care, women's and children's services, and rehabilitation; three intensive care units; and a long-term acute care hospital located within Baptist Health Hospital (GLE, 2025). The Mercy Health–Lourdes Hospital in Paducah is a mid-size, church-operated regional medical center with more than 202 beds and offers a variety of services, including specialized surgery; cardiac, cancer, and rehabilitation services; two intensive care units; and mental health care (GLE, 2025; AHD, 2024). Numerous primary care facilities are also located in McCracken County. Although no hospitals are located in Ballard County, Kentucky Care Medical Clinic in Ballard offers primary care and mental health care (GLE, 2025).

Table 3-37: Regional Health Care Facilities

County	Health Care Facility
Ballard County	Kentucky Care Barlow Medical 120 N. 4th St. Barlow, KY 42024
McCracken County	Baptist Health Hospital 2501 Kentucky Ave. Paducah, KY 42003
	Baptist Health Cancer Center 100 Kiana Ct. Paducah, KY 42001
	Behavioral Health Group Paducah Treatment Center 2705 Olivet Church Rd. Paducah, KY 42001
	Continue CARE Hospital at Baptist Health Paducah 2501 Kentucky Ave. 5th Floor Paducah, KY 42003
	Kentucky Care Paducah (South) 3360 Wayne Sullivan Dr. Paducah, KY 42003
	Mercy Health–Lourdes Hospital 1530 Lone Oak Rd. Paducah, KY 42003

Sources: GLE (2025) from the Kentucky Cabinet for Health and Family Services
Key: Ave. = Avenue; Ct. = Court; Dr. = Drive; KY = Kentucky; N. = North; Rd. = Road; St. = Street

In addition to hospitals and other medical facilities, the two counties have numerous facilities to serve seniors, including adult care homes, nursing homes, and senior centers (GLE, 2025). These facilities are shown in Table 3-38. Table 3-39 provides a summary of the number of residents per health care professional in each county collected by the University of Kentucky. Based on the data, McCracken County has substantially more health care personnel than Ballard County (GLE, 2025).

Table 3-38: Regional Facilities Serving Senior Citizens and Needing Rehabilitation

County	Assisted Living Facility
Ballard County	Gaither Suites at Kevil 859 Veterans Ave. Kevil, KY 42053
McCracken County	Charter Senior Living of Paducah 2201 New Holt Rd. Paducah, KY 42001
	Gaither Suites at West Park 4960 Village Square Dr. Paducah, KY 42001
	Providence Point Healthcare 100 Marshall Ct. Paducah, KY 42001
	Rivercrest Place 2121 New Holt Rd. Paducah, KY 42001
	Sherwood Manor Rest Home 4960 Village Square Dr. Paducah, KY 42001
	The Lakes of Paducah 2265 Olivet Church Rd. Paducah, KY 42001
	The Neighborhood at Paducah 1700 Elmdale Rd. Paducah, KY 42003
County	**Senior Citizen Center**
Ballard County	Ballard County Senior Citizens 72 Moore Blvd. Barlow, KY 42024
McCracken County	Paducah McCracken County Senior Center 1400 HC Mathis Dr. Paducah, KY 42001

Sources: GLE (2025); from the Kentucky Cabinet for Health and Family Services
Key: Ave. = Avenue; Blvd. = Boulevard; Ct. = Court; Dr. = Drive; KY = Kentucky; Rd. = Road

Table 3-39: Number of Residents per Health Care Professional

County	Primary Care Physicians	Registered Nurses	Dentists
Ballard	0	3847	0
McCracken	937	492	454

Sources: (GLE, 2025; Howard et al., 2023; Howard & Feltner, 2023; Williams et al., 2024)

There are 937 people per primary care physician, 492 people per registered nurse, and 454 people per dentist in McCracken County (GLE, 2025). However, Ballard County has no practicing primary care physicians or dentists and has 3,847 people per registered nurse (GLE, 2025; Howard et al., 2023; Howard & Feltner, 2023; Williams et al., 2024). Although the lack of health care professionals in Ballard County could imply that residents have less access to health care, it is likely that a substantial number of Ballard County residents travel to McCracken County for medical care and therefore require fewer health care services in their resident county.

3.10.3.3.2 Public Safety

The offsite Fire Support Service closest to the GMPEF Site is the West McCracken Fire Department Station 1, which is approximately 0.8 miles to the northeast (see Figure 3-47). The station is staffed by 26 volunteer firefighters and is equipped with three pumper trucks, two with a 1,000-gallon holding capacity and the ability to pump 1,250 gallons per minute and one with a 500-gallon tank; one water truck equipped with a 250-gallon water tank; and one chief truck (GLE, 2025; Kentucky Fire Trucks, 2024). The next closest offsite fire station to the GMPEF is Concord Fire Department Station 1, about 4.9 miles southeast of the GMPEF Site (GLE, 2025). The Paducah Fire Department's HazMat One team is trained and equipped to respond to incidents involving hazardous chemicals and industrial materials that may be present at facilities in the region; the team may also provide HazMat response outside of City of Paducah limits, given this capability.

The McCracken County Sheriff's Office is the principal law enforcement agency of McCracken County. Because the GMPEF Site lies outside of an urban area, the Sheriff's department would provide the bulk of the offsite law enforcement services at the site. However, the Paducah Police Department, which employs more than 100 personnel (78 of which are law enforcement officers), is also relatively close and could provide additional emergency response support (GLE, 2025). The Ballard County Sheriff's Office, which employs approximately 6–10 sworn officers, provides law enforcement services to Ballard County. Emergency response support for the GMPEF Site provided by the Ballard County Sheriff's Office would be limited due to limited personnel and considerable distance of 20 miles to the GMPEF Site (GLE, 2025).

In addition to the offsite fire and law enforcement agencies listed above, the DOE has trained personnel capable of providing fire and security services to the GMPEF.

3.10.3.3.3 Transportation Services

Transportation infrastructure and services near the GMPEF Site, are described in Section 3.2, *Transportation.*

3.11 Public and Occupational Health

The background potential for radiological and chemical exposures to the public and workers at the GMPEF have been well characterized through long-term monitoring of the DOE Paducah Site (formerly the PGDP) and reporting those results in Annual Site Environmental Reports (ASERs). The 2024 ASER (DOE, 2025e) is representative of those reports and provides a good summary of available data to support evaluation of the public and occupational health from operating the proposed GMPEF. An additional report on human health risk screening for surface and subsurface soil impacts on workers was also prepared (DOE, 2026b).

DOE has also prepared a report for the approximately 100-acre portion (Leasing Parcel A) of the GMPEF Site (DOE, 2025a). This report focuses on Parcel A and describes site-specific information relevant to characterizing the potential background radiological and chemical exposure potentials for the site. This report determined the environmental conditions are such that leasing the property is consistent with safety and the protection of public health and the environment.

In addition, the 2025 PLEF ER and 2026 PLEF Draft EIS, which is proposed to operate immediately south of the GMPEF, also summarizes key environmental data relevant to health impacts.

Earlier, DOE also prepared a DOE/EA-1927 for potential land transfers of portions of the PGDP for other uses (DOE, 2015a). That EA concluded:

> Past activities at the PGDP site have resulted in releases of radionuclides and chemicals to the environment. Each year, DOE releases a site environmental report on the surveillance of radiological and nonradiological contaminants in the environment around the site. … Existing contamination at the site would remain a small and decreasing potential source of exposure to members of the public. Radionuclides that are most likely to be sources of exposure include isotopes of uranium and technetium-99. Potentially present at much lower levels are isotopes of plutonium, neptunium-237, americium-241, and cesium-137. Some of these radionuclides might be present in the area background radiation, typically from atmospheric fallout. Chemicals that could be present include arsenic, hydrogen fluoride, fluoride ion, and PCBs.

The annual site environmental reports indicate that existing levels of these contaminants in the environment around the DOE Paducah Site are low.

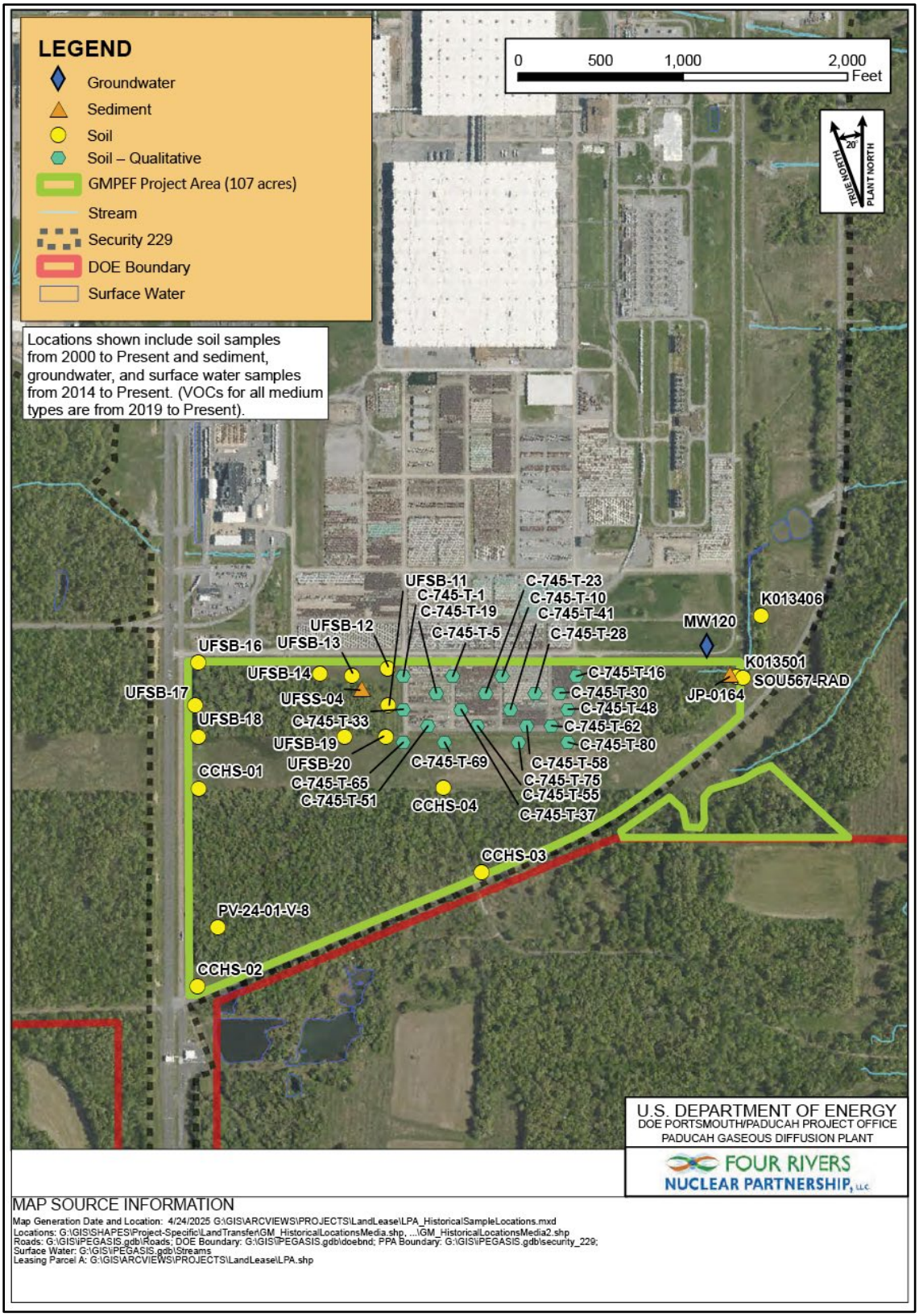
There are two potentially significant exposure hazards at the GMPEF Site that are described in this section: radiation and HF. Existing sources of radiation near the GMPEF Site include natural background radiation

sources and man-made sources associated with activities at the DOE Paducah Site, and potential sources from the Honeywell uranium hexafluoride (UF_6) conversion facility near Metropolis, Illinois, which is approximately 6 miles (10 kilometers) northeast of the GMPEF Site. The Honeywell facility converts "yellow cake" uranium to UF_6. The PLEF could present radiation and HF hazards to workers at the GMPEF as well as to the public similar to those present from past operations at the PGDP.

Note that the PGDP ceased enriching uranium in 2013. Thus, current emissions are not expected to be a significant contributor to area dose rates in the vicinity of the GMPEF Site. However, Mid-America Conversion Services, LLC operates a DUF_6 conversion facility on the Paducah Site where DUF_6 is converted to HF and a uranium oxide compound. Any public doses from this facility are included in the overall dose to the public reported annually by DOE for the Paducah Site.

In late 2025, DOE and Four Rivers Nuclear Partnership, LLC, requested additional human health risk evaluation of chemicals and radionuclides of potential concern identified in the leasing data package for Leasing Parcel A soils to include evaluation of risks under the residential and recreational use exposure scenarios. This evaluation was published in *Additional Human Health Risk Screening of Leasing Parcel A Surface Soil and Subsurface Soil* (DOE, 2026b). It conservatively concluded that all the radiological (U-238) and chemical contaminant risks fall within the CERCLA acceptable range. Not all the soil risks fall within the Kentucky Risk Assessment Guidance of an excess cancer risk of one in a million for cancers and a hazard index of less than 1 for non-cancers, but the modeling is quite conservative. In the real world, exceeding the Kentucky Guidelines would likely just require more detailed modeling with more realistic assumptions. While there are some legacy chemical hazards at the DOE Paducah Site, outside of the GMPEF Site boundary, as described in Section 3.11.3, *Major Sources and Levels of Chemical Exposure*, the most significant potential nonradiological exposure hazard to the public at the GMPEF Site would be HF from current and planned operations at DOE Paducah Site, PLEF, and GMPEF.

Figure 3-49 illustrates the historical chemical and radiological sample locations within the area of the GMPEF Site. These chemical and radiological sample results are available for review in 10.2Appendix C, *Historic Chemical and Radiological Sample Results for Parcel A*.



Source DOE (2025a) ENCL 1 – Leasing Data Package, Figure 14, Historical Sample Locations by Media

Figure 3-49: Historical Sample Locations by Media for the GMPEF Site

3.11.1 Major Sources and Levels of Background Radiation Exposure

Background radiation is defined by the NRC to be the following:

> The natural radiation that is always present in the environment. It includes cosmic radiation which comes from the sun and stars, terrestrial radiation which comes from the Earth, and internal radiation which exists in all living things. (NRC, 2021).

Natural radiation sources are either primordial or cosmogenic. Primordial radionuclides are left over from when Earth and the universe were formed. They have long half-lives on the order of hundreds of millions of years and include the progeny or decay products of the long-lived radionuclides. On average, a U.S. resident receives an annual radiation exposure from natural sources of about 310 millirems (mrem) (3.1 millisieverts [mSv]). Radon and thoron gases account for two-thirds of this exposure. Cosmic, terrestrial, and internal radiation account for the rest (NRC, 2024b; EPA, 2025j).

Man-made sources of radiation from medical, commercial, and industrial activities contribute roughly 310 mrem more to our annual exposure. Among the largest of these sources is a computed tomography (CT) scan, which accounts for about 150 mrem. Other medical procedures make up another 150 mrem or so each year. Some consumer products such as tobacco, fertilizer, welding rods, exit signs, luminous watch dials, and smoke detectors contribute about 10 mrem per year (NRC, 2024b).

Natural background radiation contributes about 50 percent (approximately 310 mrem [approximately 3.1 mSv]) of the average annual dose received, whereas diagnostic medical procedures and nuclear medicine procedures contribute 48 percent (approximately 298 mrem [approximately 2.98 mSv]), and consumer products and industrial and occupational exposure makes up the balance for a total annual average radiation exposure of 620 mrem (6.2 mSv) (NRC, 2024b).

3.11.2 Current Sources and Levels of Exposure to Radioactive Materials

3.11.2.1 *Sources*

DOE uses information from a radiation monitoring program that has been established for the DOE Paducah Site and the associated DUF_6 conversion facility to estimate annual dose to the public to ensure compliance with applicable limits. The dose estimates consider exposure from direct radiation, atmospheric releases, ingestion of groundwater, ingestion of drinking water, incidental ingestion of surface water, and incidental ingestion of sediment. Direct exposure to radiation from cylinder storage yards is the most significant potential source of radiation to members of the public who use the public lands surrounding the Paducah Site. Data for direct exposure is available from several radiological surveys.

Aerial Radiological Surveys

Radiological surveys of PGDP were conducted in 1976 and 1990 and reported in the Leasing Data Package for Leasing Parcel A, Paducah Gaseous Diffusion Plant, Paducah, Kentucky, DOE/LX/07-2522&D2 (DOE, 2025a). The purpose of those aerial radiological surveys was to determine the extent to which plant operations may have impacted the radiological signature of the plant surroundings. Another aerial radiological survey was conducted over PGDP and the surrounding area from October 28, 2009, to November 2, 2009. The purpose of the last aerial radiological survey was to measure the terrestrial radiological environment within and around PGDP to update previous aerial radiological survey data from 1976. The aerial radiological survey used a large array of helicopter-mounted sodium iodide gamma ray detectors. The aerial survey was flown at an altitude of approximately 150 feet along a series of parallel lines spaced 250 feet apart and encompassing an area of approximately 25 square miles bordered on the north by the Ohio River (DOE, 2015b).

The areas covered by the aerial radiological surveys completed in 1976 and 1990 were consistent with the 2009 aerial radiological survey. A comparison of the 2009 aerial radiological survey and the 1990 aerial radiological survey is shown on Figure 3-50 (DOE, 2025a). This figure indicates changes to the configuration of the DU cylinder storage yards since the 1990 aerial radiological survey. In particular, the footprint of the elevated terrestrial exposure rate at the southern cylinder yard, near Leasing Parcel A (GMPEF Site), has increased since 1990, while that of the western cylinder yard has decreased.

No significant man-made gamma activity was detected outside the DOE Limited Area boundary during the aerial radiological survey. The areas with the greatest activity at PGDP are cylinder storage yards located near the southern portion of PGDP (radiation emissions near the cylinder storage yards are informally referred to as "shine") along the north-central portion of the GMPEF Site.

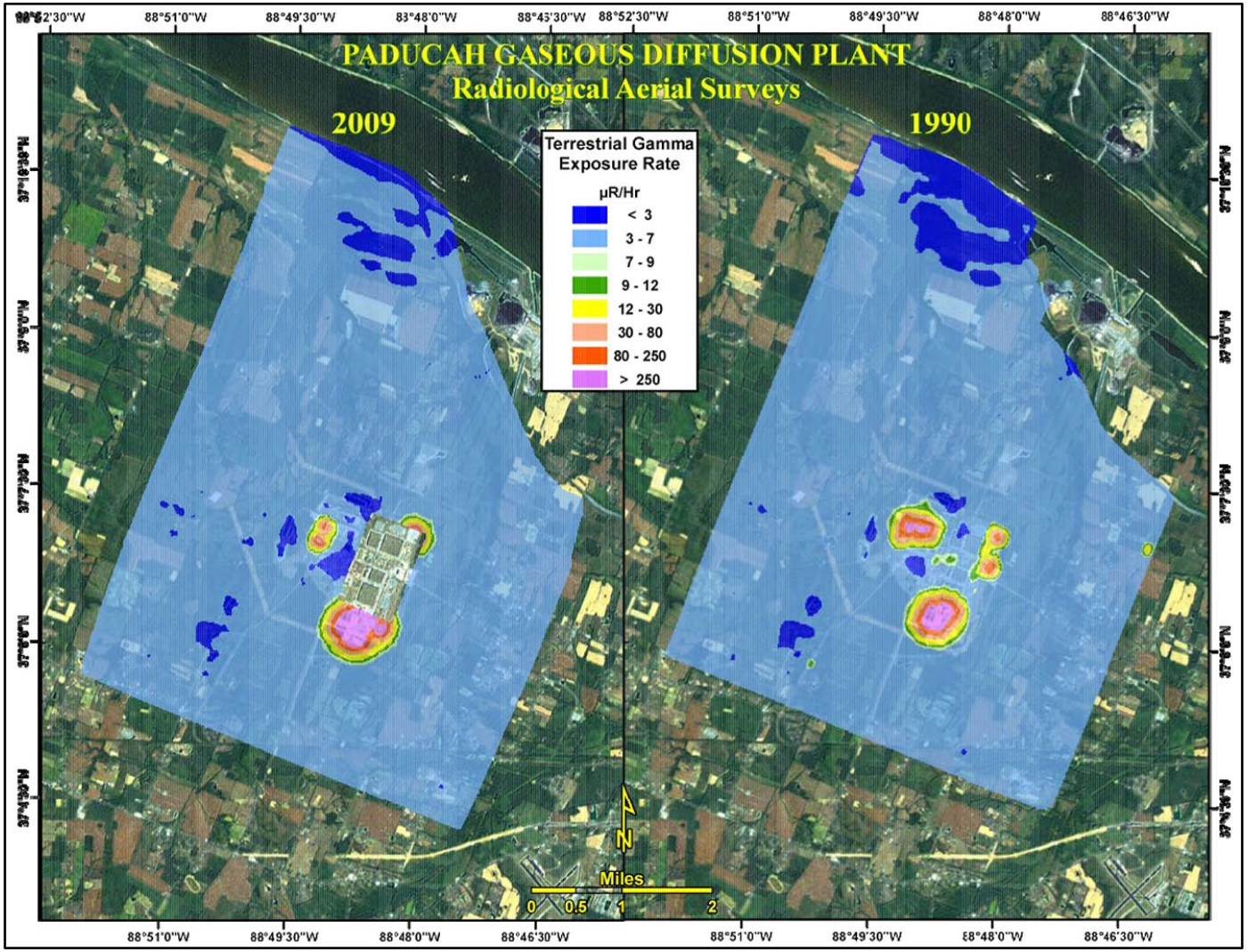
Sitewide Evaluation for the Soils

Radiological and visual walkover surveys were conducted over DOE-owned property (including property licensed to the Commonwealth of Kentucky), encompassing an area of approximately 2,676 acres. The purpose of these visual and radiological walkover surveys was to visually identify anomalies and to complete a radiological scoping survey of the entire area with a targeted radiological survey of identified anomalies (DOE, 2025a). These surveys were completed between January 5, 2009, and April 23, 2010.

DOE completed the 2009–2010 visual and radiological walkover surveys, and no new contaminated areas were identified, no areas were found to have radiological readings greater than twice instrument background, and no areas required action based on criteria established in the Sitewide Evaluation Work Plan (DOE, 2025a).

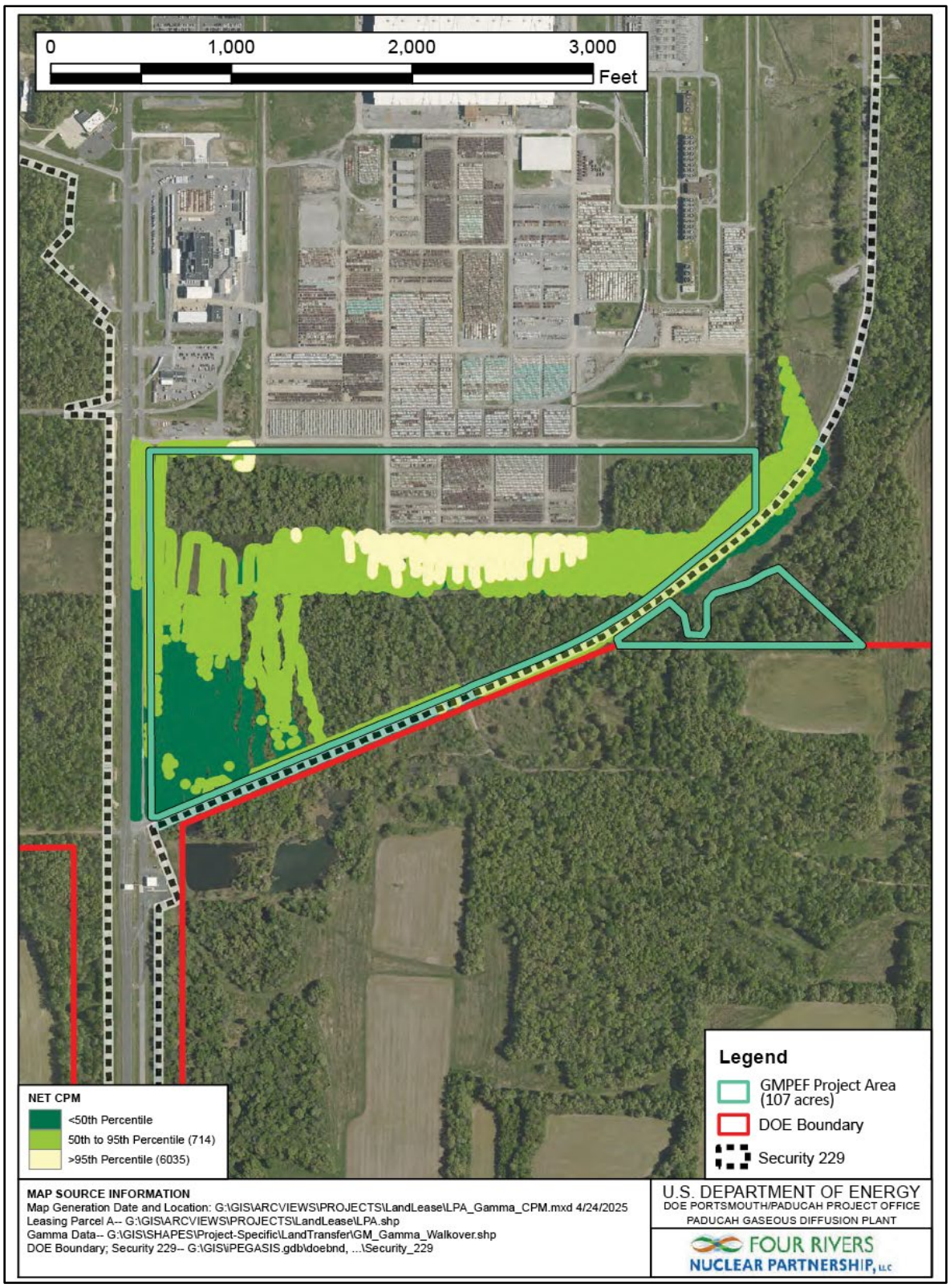
Figure 3-51 provides the results of the radiological walkover survey within Leasing Parcel A. The radiological walkover survey for the GMPEF Site started on January 22, 2009, and was completed on March 17, 2009. Due to the ice storm of January 2009, portions of the wooded areas were not accessible for the radiological walkover survey. For the data shown on Figure 3-51, there were 25,287 measurements with the net gamma counts per minute ranging from 91 to 17,358 counts per minute. The highest measurements, represented in the figure by measurements greater than the 95th percentile of the data set, reflects the interference from the cylinder storage yard shine, which prevents an accurate measurement of surficial soil levels near the cylinder storage yards.

Consistent with the FFA (EPA, 1998) and the approaches set forth in the National Contingency Plan, the results of the sitewide evaluation determined that no removal or remedial actions were required for the 534 anomalies identified. The conclusion from the evaluation of the results of the visual and radiological walkover surveys and their associated analyses is that no areas were identified that required either further CERCLA evaluation under the FFA or designation as solid waste management units (SWMUs) or Areas of Concern (DOE, 2015b). The results demonstrate that these anomalies do not represent unknown areas of contamination that pose a threat to the public or environment.



Source: DOE (2025a, p. 62)

Figure 3-50: Comparison of 1990 and 2009 Terrestrial Gamma Exposure Rate Results



Source: DOE (2025a, p. 63)

Figure 3-51: Historical Gamma Walkover Survey Results for the GMPEF Site

The Honeywell UF_6 conversion facility could contribute to radiation exposure to the public from direct exposure, atmospheric releases, ingestion of water, and exposure to water from liquid releases (e.g., swimming, boating, and shoreline use). The Honeywell facility reports gaseous and liquid effluents bi-annually and must demonstrate compliance with 10 CFR 20, Appendix B, effluent limits. Nuclides reported in both liquid and gaseous effluent releases include natural uranium, radium-226, and thorium-230. Despite these routine releases, the Honeywell facility is not expected to be a significant contributor of radiation in the immediate vicinity of the GMPEF Site because the dose at the GMPEF Site is mostly attributable to direct exposure from the cylinder storage yard and the Honeywell facility is approximately 6 miles (10 kilometers) from the GMPEF Site. Furthermore, if there were any releases from the Honeywell facility near the GMPEF Site, they would be detected through the extensive monitoring that is conducted by DOE in the area and thus would be reflected in the annual DOE dose estimates. In addition, the prevailing wind direction for much of the time is from the west/southwest which substantially reduces the impacts of releases from the Honeywell facility.

3.11.2.2 *Exposure*

DOE has summarized the potential dose to the maximally exposed individual (MEI) and estimated collective population dose (DOE, 2025e). Table 3-40 summarizes the potential dose to the MEI and the estimated collective population dose. The monitoring results in this table demonstrate the continued effectiveness of radiological control measures practiced at the Paducah Site.

Table 3-40: Summary of Potential Radiological Dose to the Public from the Paducah Site, 2024

Pathway [a]	Dose to MEI (mrem) [b] (mrem × 0.01 = mSv)	Percent of DOE 100 mrem per Year Limit	Estimated Collective Population Dose (person-rem) (person-rem × 0.01 = person-Sv)	Population Within 50 Miles
Atmospheric releases [c]	6.5E-03	0.065	7.3E-02	~504,000
Ingestion of groundwater [d]	See note [d]	See note [d]	See note [d]	
Ingestion of drinking water [d]	See note [d]	See note [d]	See note [d]	
Incidental ingestion of surface water	1.6E-01	0.16	See note [e]	
Incidental ingestion of sediment	7.8E-02	0.078	1.2E-02 [f]	150
Direct radiation	1.1E+00	1.1	1.7E-01 [f]	150
All relevant pathways [a,b,g]	1.4E+00	1.4	2.5E-01	

Source: DOE (2025e)
Key: CAP-88 PC = Clean Air Act Assessment Package-1988; Personal Computer; DOE = United States Department of Energy; KAR = Kentucky Administrative Regulations; MEI = maximally exposed individual; mrem = millirems; mSv = millisievert; rem = roentgen equivalent man; Sv = sievert; WKWMA = West Kentucky Wildlife Management Area
Notes:
[a] Pathways are defined in previous sections.
[b] Maximum allowable exposure from all sources is 100 mrem per year (DOE Order 458.1), which is consistent with 902 KAR 100:019, Section 10 (1)(a).
[c] Doses associated with atmospheric releases also include ingestion pathways considered in the CAP-88 PC food chain modeling routines.
[d] Ingestion of groundwater and ingestion of drinking water were not viable pathways for exposure to the MEI because neither pathway was used as a drinking water source.
[e] Incidental ingestion of surface water in plant creeks and ditches is not applicable for calculating collective dose to residents who reside within 50 miles of the Paducah Site. Collective dose is not calculated for the incidental ingestion pathway because it is unlikely that a population of individuals would swim repeatedly in either Bayou Creek or Little Bayou Creek. Because this pathway is more likely to involve individuals, it is more suitable for the MEI dose calculation.

Table 3-40: Summary of Potential Radiological Dose to the Public from the Paducah Site, 2024

Pathway [a]	Dose to MEI (mrem) [b] (mrem × 0.01 = mSv)	Percent of DOE 100 mrem per Year Limit	Estimated Collective Population Dose (person-rem) (person-rem × 0.01 = person-Sv)	Population Within 50 Miles

[f] Population dose for direct radiation and incidental ingestion of sediment is based on a representative assumption using the estimated visitors hiking in WKWMA only.
[g] The dose to the MEI from all relevant pathways is calculated by summing the dose from individual pathways. The all-pathways dose is considered to be an upper bound of the expected dose to the MEI because no single individual would receive the sum of the calculated pathway doses due to the dose being calculated for exposure at varying locations and any individual's varying activity patterns.

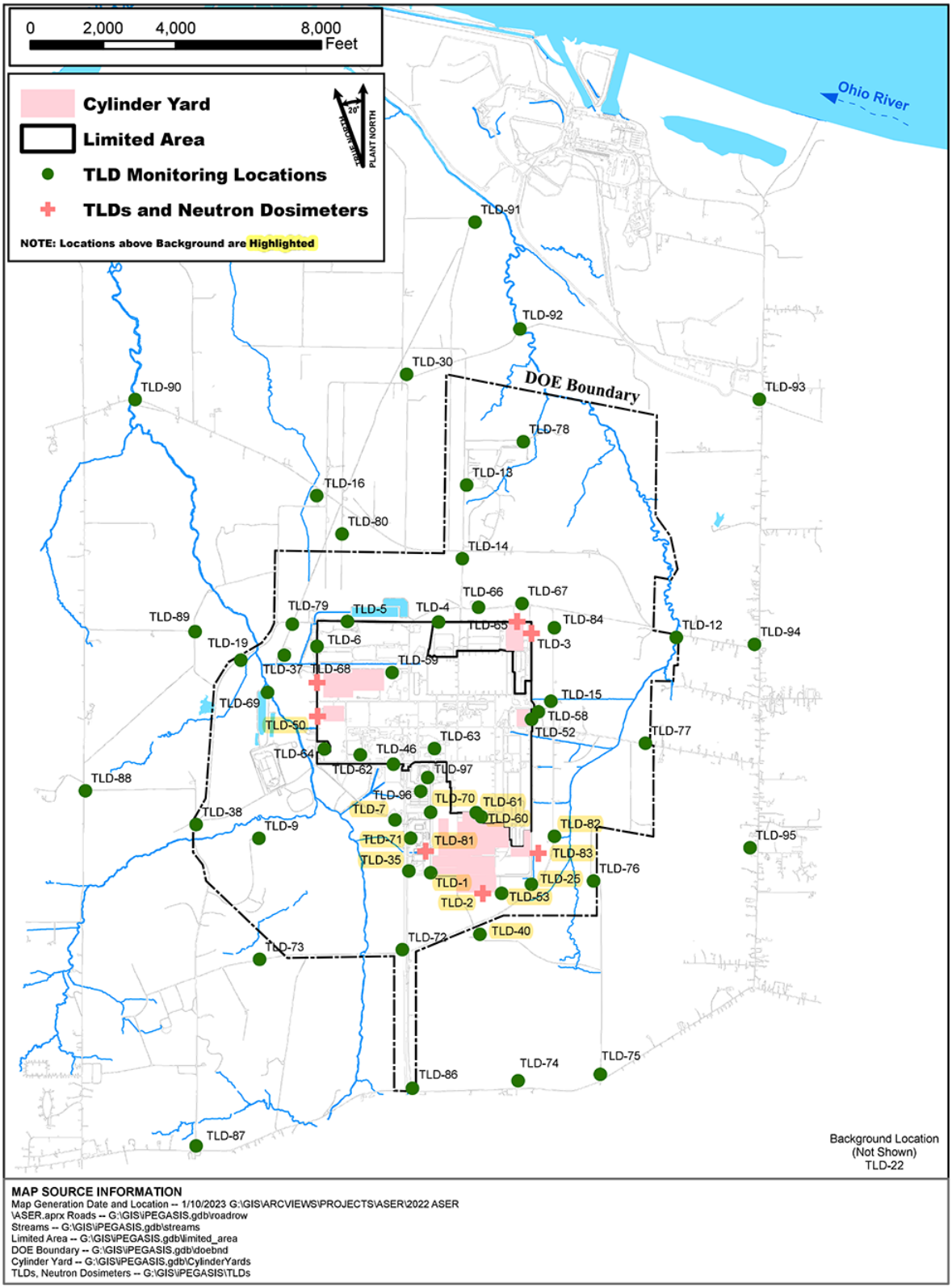
Table 3-40 indicates that direct radiation exposures from the cylinder yard contributes more than 98 percent of the offsite dose to the public. Therefore, the following sections focus on the direct exposure pathway and refer the reader to the DOE Paducah Site ASER (DOE, 2025e) for details on the other negligible exposure pathways.

3.11.2.2.1 Direct Exposure

Sources of external radiation at the DOE Paducah Site include the UF_6 cylinder storage yards, the operations inside the uranium conversion facility buildings, and small items such as instrument calibration sources. As discussed above, cylinder storage yards have the greatest potential to contribute to the public dose. DOE previously licensed a portion of the Paducah Site (known as the WKWMA) to the KDFWR. While there are no residences within this area, it was open to the public for recreational uses. However, following recent land transfers, future use of the area would include industrial uses.

The DOE external radiation monitoring program is designed to provide data on external radiation exposure from DOE operations to members of the public. The primary factor in selecting monitoring locations is the potential for a member of the public to be exposed to external radiation. Locations near the Paducah Site were also chosen for accessibility, representative exposure potentially received by members of the public, and area monitoring for individuals passing through the area previously utilized by the WKWMA. A surveillance network of environmental thermoluminescent dosimeters and optically stimulated luminescence dosimeters monitor locations inside the Paducah Site security fence and at the perimeter of the Paducah Site, in addition to outfalls, ditches, and background locations. Dosimeters were also placed in areas that historically received the highest radiation exposure. Figure 3-52 shows the dosimeter monitoring locations.

In 2024, 13 out of 64 monitoring locations showed results statistically above the background level. All 13 of these locations were, historically, the areas with the highest measured results throughout the monitoring period. These locations were adjacent to or in close proximity to the cylinder storage yards, which are not regularly accessible to the public. Therefore, the potential external radiation dose calculated from these locations would not represent the actual public external radiation dose.



Source: DOE (2023)

Figure 3-52: DOE Dosimeter Locations in the Vicinity of the Paducah Site

Hypothetical Individual 80 Hour/Year Dose at WKWMA

The hypothetical individual who would receive the maximum cumulative dose from all pathways is known as the MEI. For 2024, the MEI scenario for a potential external radiation effective dose assumed a member of the public visited accessible areas of the land previously utilized by the WKWMA next to the Paducah Site, where potential exposure was highest, for a total of 80 hours per year. Under this scenario, a member of the public could receive 3.74 mrem of external radiation (DOE, 2025e). This is well below regulatory limits and a small fraction of the annual average radiation exposure to an individual from natural and other man-made sources.

An estimated external radiation effective collective dose for 2024 was calculated by multiplying the MEI dose by the total number of visitors hiking within the accessible areas previously utilized by the WKWMA annually (150 persons). This resulted in an estimated external radiation effective collective dose of 1.7E-01 person-roentgen equivalent man (rem). As shown in Table 3-41, this is consistent with previous results cited in annual site environmental reports.

Table 3-41: Comparison of Potential Radiological Dose to the Maximally Exposed Individual for the Direct Radiation Pathway

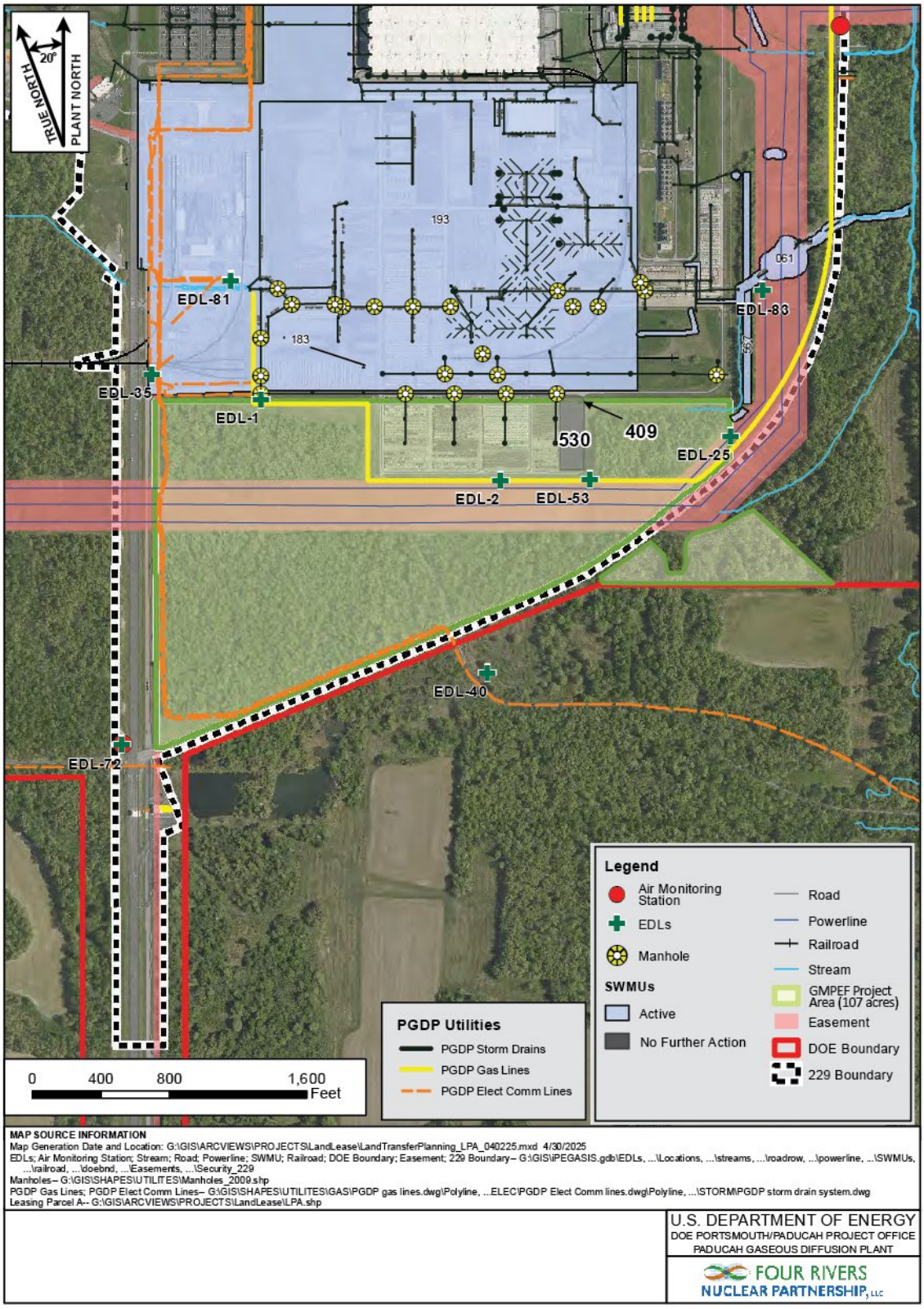
Direct Radiation Pathway	2020	2021	2022	2023	2024
Dose to MEI (mrem) (mrem × 0.01 = mSv)	1.9E+00	2.1E+00	1.8E+00	6.3E+00	1.1E+00
Percent of DOE 25 mrem per year radioactive waste public dose constraint	7.6%	8.5%	7.1%	2.5%	4.5%
Percent of DOE 100 mrem per year limit	1.9%	2.1%	1.8%	0.63%	1.1%
Estimated collective population dose (person-rem) (person-rem × 0.01 = person-Sv)	2.8E-01	3.2E-01	2.7E-01	9.4E-02	1.7E-01
Population within 50 miles*	150	150	150	150	150

Source: DOE (2025e) (Table 4.12, "Comparison of potential radiological dose to the maximally exposed individual for the direct radiation pathway," page 4-20)
Population dose for direct radiation is based on a representative assumption, using only the estimated number of visitors hiking in the WKWMA.
Key: DOE = United States Department of Energy; MEI = maximally exposed individual; mrem = millirems; mSv = millisievert; rem = roentgen equivalent man; Sv = sievert; WKWMA = West Kentucky Wildlife Management Area

Radiological Doses Within the GMPEF Site

DOE Order 458.1, Chg 4 (LtdChg), establishes requirements to protect the public and environment from radiation exposure. DOE's external radiation monitoring program is designed to provide exposure data on direct radiation from DOE operations to members of the public. Figure 3-53 shows environmental dosimeter locations within, and adjacent to, the GMPEF Site. The primary sources for radiation exposure at the GMPEF Site are the DUF_6 cylinder storage yard on the north side of the Site. These environmental dosimeters are also useful in assessing potential radiation exposure to site employees. (DOE, 2025a)

The NRC is responsible for enforcing worker safety requirements with respect to radiation, which includes those set forth in 10 CFR Part 20, through its licensing application review process, its permitting process, and ongoing inspections during facility operations. The annual radiation dose limit for general employees in applicable regulations is 5,000 mrem. These occupational limits will be captured in the Lessee's radiation protection program, which is required by both the NRC and DOE for site operations. The radiation protection program will require employee dose monitoring and will take into account doses from adjacent areas in addition to doses related to the Lessee's operations. Also, if the potential Lessee uses the property to construct and operate a radiological facility, that facility will require all necessary permits and authorizations from the requisite regulatory body to cover construction and operation (e.g., NRC license).



Source: DOE (2025a)

Figure 3-53: Key Features and EDL Radiological Monitoring Locations Near the GMPEF Site

Table 3-42 shows facility-related doses at each of the monitoring locations based on the 2024 environmental dosimeter measurements (DOE, 2025a). The quarterly facility-related dose (F_Q) is the dose received during a quarter (91 days for 24 hour/day) at the monitoring location due to radiation from the facility, while the annual facility-related dose (F_A) is the dose received during a year (365 days for 24 hour/day) at the monitoring location due to radiation. F_Q and F_A are represented as follows:

$$F_Q = M_Q - \sigma B_Q$$

$$F_A = M_A - \sigma B_A$$

Where:

M_Q = normalized quarterly field dose (measured field dose that is normalized to a standard 91-day quarter)

σB_Q = representative baseline quarterly background dose

M_A = normalized annual dose (sum of the normalized quarterly field doses; represents the measured dose over a 365 day/24 hour per day period)

σB_A = representative baseline annual background dose

The facility-related doses in Table 3-42 exclude the background annual radiation dose of 91.5 mrem (the background radiation dose is determined from 11 monitoring locations that are unaffected by Paducah Site operations) (DOE, 2025a).

From Table 3-42, locations 1, 2, 25, and 53, which are situated on the GMPEF Site, indicated a facility-related dose during the monitoring period (the F_A is the dose received during a year by a field dosimeter at a monitoring location due to radiation from the monitored facility and excludes the background annual radiation dose plus the annual minimum differential, which is the smallest facility-related dose that can be detected during a year above the baseline annual background). These locations are closer to the perimeter of the DUF_6 facility and the cylinder storage yards (refer to Figure 3-53). Historically, these locations have shown a facility-related dose. Locations 35, 40, and 72 did not indicate a facility-related dose. (DOE, 2025a)

The F_As in Table 3-42 do not represent doses to an individual, but the results can be used to determine an estimate of the maximum radiation dose to a general employee at the site based on the time an individual would be in the area working. For instance, assuming an employee works at the site 2,000 hour/year (40 hour/week for 50 weeks), and is using the highest facility-related dose from dosimeter location 2 (1,099.4 mrem), provides an estimated maximum external radiation dose to the employee of 251 mrem/year (approximately 5 percent of the annual dose limit for a general employee). (DOE, 2025a)

This would be a conservative, or protective, estimate as it is not realistic that the employee would be positioned in the vicinity of EDL-2 the entire time, but the employee would move around the leased area while performing work. The last column in Table 3-42 shows the maximum effective dose to the industrial worker may vary from near background level (at EDL-72 location) to 251 mrem/year (at EDL-2 location). This indicates that an employee that works in the lease area will not receive an external radiation dose that exceeds the regulatory limit of 5,000 mrem. (DOE, 2025a).

Table 3-42: Facility-Related Dose at Monitoring Locations

Dosimeter Location	σB_Q (mrem)	Quarterly Doses M_Q (mrem)				Quarterly Doses Without Bkg $F_Q = M_Q - \sigma B_Q$ (mrem)				Bkg Dose σB_A (mrem)	Annual dose with Bkg M_A (mrem)	Facility dose Without Bkg $F_A = M_A - \sigma B_A$ (mrem)	Maximum Effective Dose to the Industrial Worker (based on 2,000 hr/ year) (mrem)
2024 Quarters →		**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**				
1	22.9	189.6	229.8	224.2	205.4	166.7	206.9	201.3	182.5	91.5	848.9	757.4	172.9
2		293.3	303.6	279.4	314.6	270.4	280.7	256.5	291.7		1,190.9	1,099.4	251.0
25		29.6	25.5	30.0	24.3	*	*	*	*		109.4	17.9	4.1
35		27.0	26.1	27.9	25.6	*	*	*	*		106.6	15.1	3.4
40		24.4	25.0	26.9	24.6	*	*	*	*		100.9	9.4	2.1
53		107.3	111.1	112.6	108.3	84.4	88.2	89.7	85.4		439.3	347.8	79.4
72		25.3	22.4	21.8	22.3	*	*	*	*		91.8	*	*
81		97.2	100.9	103.3	76.9	74.3	78.0	80.4	54.0		378.2	286.7	65.5
83		48.7	46.6	50.8	51.1	25.8	23.7	27.9	28.2		197.2	105.7	24.1

Source: DOE (2025a) (ENCL 1 – Leasing Data Package, page 81)
Key: Bkg = background; F_A = annual facility-related dose; F_Q = quarterly facility-related dose; hr = hour; M_A = normalized annual dose; M_Q = normalized quarterly field dose; mrem = millirems; σB_A = representative baseline annual background dose; σB_Q = representative baseline quarterly background dose
Notes:
*Not detected, where M_Q or M_A is approximate to baseline/background.
Locations 1, 2, 25, and 53 are on Leasing Parcel A.
The measured background dose is 22.9 mrem per quarter or 91.5 mrem per year.

The EPA has recommended 12 mrem/year as a dose-based limit for a member of the public that was estimated to achieve protection at a 3×10^{-4} cancer risk for a standard 30-year residential exposure scenario (EPA, 2013). This dose-to-risk relationship of 12 mrem/year to a 3×10^{-4} lifetime cancer risk for a 30-year resident can be used to estimate the external radiation dose to a Paducah worker that would result in a lifetime cancer risk of a 3×10^{-4}. This is done by calculating the ratio of hours of total exposure for the outdoor worker to the external radiation source as compared to the total hours of exposure for the 30-year resident used in the 2014 EPA guidance. The outdoor worker is used to represent the Paducah worker because it is the receptor receiving the exposure with the highest risk in the screening risk evaluation for soil (Section 7.4.2 of DOE, 2025a). Based on a ratio of the outdoor worker total hours (37,000 hours) to 30-year resident total hours (252,000 hours), the estimated dose at which a worker would incur a lifetime cancer risk of 3×10^{-4} is 81.7 mrem/year. This indicates, depending on the worker's activities with respect to time spent at various locations within the parcel and the resulting dose of external radiation, that risks to workers may exceed 3×10^{-4} lifetime cancer risk. These risks would be mitigated through implementation of a radiation protection program using "as low as reasonably achievable" protective measures including time, distance, and shielding (DOE, 2025a).

The above estimates are based on dose measurements collected during the 2024 calendar year. The cylinder yards are regularly used by DOE contractors and cylinders are transient as they are moved into and out of storage yards during current operations. Also note that relocation of cylinders farther from the parcel in the future, if needed, would result in lower radiation doses within the GMPEF Site. (DOE, 2025a).

Historical monitoring has shown that the potential annual dose to an MEI member of the public from DOE operations at the Paducah Site has been less than 10 mrem/year due to limited exposure time and distance from access points of the public to DOE cylinder yards. Location EDL-40 is south of Dyke Road (Figure 3-53). While Leasing Parcel A is not readily accessible to the public, a member of the public at location EDL-40 near the DOE property boundary would have received an external radiation effective dose of 1.1 mrem in 2024. In the 2023 Annual Site Environmental Report, the calculated radiation dose from DOE activities at the Paducah Site that could be received by an MEI of the public, assuming exposure from all relevant pathways, was 5.8 mrem/year (DOE, 2024b). The largest contributor to this calculated dose was the direct radiation pathway, or external radiation, which contributed 5.6 mrem to this total. Atmospheric releases, incidental ingestion of surface water, and incidental ingestion of sediment contributed the remainder of this calculated dose to the maximally exposed individual. (DOE, 2025a).

Historical monitoring has shown that the potential annual dose from DOE operations at the Paducah Site to the public for the direct radiation pathway has been less than 10 mrem/year due to limited exposure time and distance from access points of the public to DOE cylinder storage yards. The GMPEF Site is not readily accessible to the public.

3.11.2.2.2 Atmospheric Releases

Specific activities that could generate fugitive emissions include the transport and disposal of waste, decontamination of equipment, and most environmental remediation activities. Ambient air monitoring, which monitors fugitive emissions from all Paducah Site operations (including DUF_6 conversion facility operations), uses nine continuous air monitors surrounding the Paducah Site, including one that collects data from a background location. As illustrated in Table 3-40, atmospheric emissions from Paducah Site activities contribute negligible doses to the public. Refer to Section 4.3 of the ASER for more information (DOE, 2025e).

3.11.2.2.3 Ingestion of Water

Radioactive contaminants released to surface water may remain dissolved or suspended as particulates in surface water; may be deposited in sediment, on the ground, or on vegetation by irrigation; may be

absorbed into plants and animals; or may infiltrate to the groundwater. As illustrated in Table 3-40, ingestion of radioactive materials contributes negligible doses to the public from Paducah Site activities. Refer to Section 4.4 of the ASER for more information (DOE, 2025e).

3.11.2.2.4 Incidental Ingestion of Sediment

DOE sediment sampling at the Paducah Site in 2022 included radiological and nonradiological constituents. Sampling locations were selected to facilitate the analysis of site-specific radiation exposure pathways and to indicate the accumulation of undissolved radionuclides in the aquatic environment. Sampling locations were selected to represent areas of public access, areas with the potential to introduce plant effluents to the environment or areas with the potential for any unplanned release, and to verify the effectiveness of the Paducah Site's effluent monitoring. Refer to Section 4.5 of the ASER for more information (DOE, 2025e). The estimated dose to the MEI in 2024 from incidental ingestion of sediment was 7.8×10^{-2} mrem (DOE, 2025e).

3.11.3 Major Sources and Levels of Chemical Exposure

Since 2011, the DUF_6 conversion facility at the Paducah Site has used a Dry Conversion Process to convert UF_6 to triuranium octoxide. This conversion process offers an environmental advantage over the ammonium diuranate process due to the elimination of liquid waste. By-products of the Dry Conversion Process are HF gas (converted to liquid form) and calcium fluoride, which are sold for commercial use. No active emission points at the Paducah Site require nonradiological air monitoring. However, environmental monitoring activities cover both radiological and nonradiological contaminants (GAO, 2022).

The Paducah Site meets CWA regulations for surface water monitoring through its KPDES permit for effluent discharges to Bayou Creek and Little Bayou Creek. Surface water monitoring locations at the Paducah Site and the monitoring program under which they are sampled routinely are shown in Figure 3-54 as are trends for TCE results in selected surface water monitoring locations over the last 5 years. Ranges of this and other detected analytes in surface water are summarized in Table 3-43.

Table 3-43: Ranges of Analytes in Surface Water Samples

Analyte	Range (µg/L)
Anions	
Chloride	519–36,900
Sulfate	2,630–54,300
Wet Chemistry Parameters	
Biochemical Oxygen Demand	2,670–24,600
Chemical Oxygen Demand	13,200–113,000
Dissolved Solids	81,000–322,000
Hardness – total as $CaCO_3$	26,600–238,000
Nonsettleable Solids	14,400–18,800
Settleable Solids	12,500–231,000
Suspended Solids	600–276,000
Total Organic Carbon	4,040–27,800
Total Solids	109,000–550,000
Volatile Organic Compounds	
TCE	0.39–0.61
PCBs	
PCB-1248	0.0461–0.0807
PCB-1254	0.0365–0.0383

Table 3-43: Ranges of Analytes in Surface Water Samples

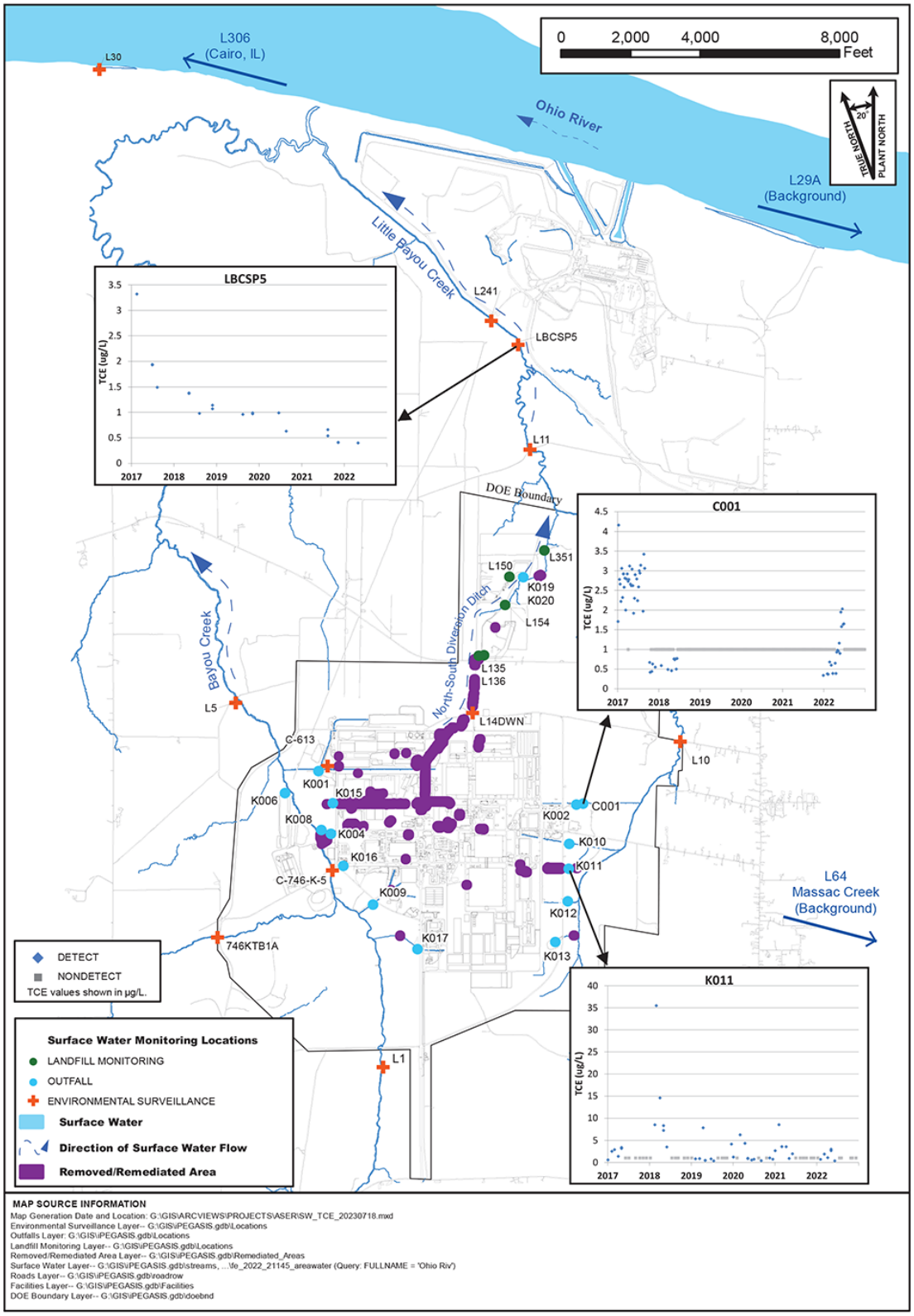
Analyte	Range (µg/L)
PCB-1260	0.0709–0.528
Total polychlorinated biphenyls	0.0365–0.528
Other Organics	
Oil and grease	1,350–3,300
Metals	
Aluminum	60–522
Barium	40.7–64.5
Calcium	12,100–29,200
Copper	0.941–3.49
Iron	97.7–21,500
Lead	0.617–0.922
Magnesium	2,740–5,610
Manganese	22.6–266
Mercury	0.00664–0.0467
Nickel	0.671–1.56
Phosphorus	22–1,370
Potassium	3,210–9,160
Sodium	759–27,300
Uranium	0.163–470
Zinc	12.2–147

Source: DOE (2025e) (Table 5.2., "Ranges of detected analytes in 2024 surface water samples," page 5-3)
Key: $CaCO_3$ = calcium carbonate; PCB = polychlorinated biphenyls; TCE = trichloroethene; µg/L = micrograms per liter

Sediment monitoring locations are shown on Figure 4-3 of the DOE Paducah Site ASER (DOE, 2025e). Sediment sampling is only conducted for radionuclides and PCBs. Total PCBs were detected in sediment during 2024 at levels from 1.81 micrograms per kilogram (µg/kg) to 293 µg/kg with an action level of 17,900 µg/kg for the recreational user. However, signs are posted along Bayou Creek and Little Bayou Creek to warn members of the public about the possible risks posed by recreational contact with these waters, stream sediments, and fish caught in the creeks (DOE, 2025e).

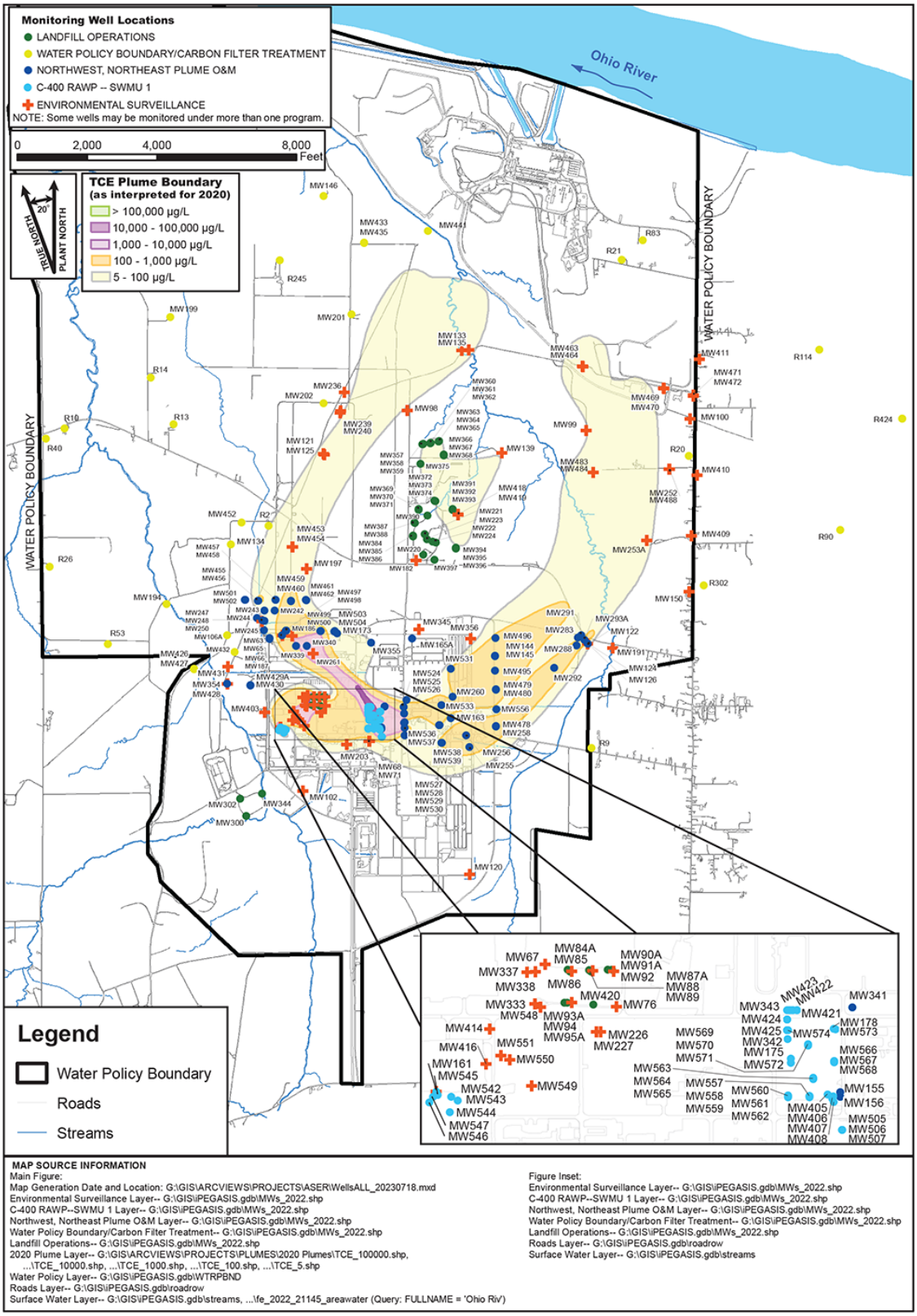
Groundwater monitoring at the Paducah Site is required by a combination of State and Federal regulations, legal agreements with the Kentucky Department for Environmental Protection, and DOE Orders. More than 300 monitoring wells and residential wells are used to track the flow of groundwater and to identify and measure groundwater contaminants. The results of the Paducah Site Investigation (Phase 1) in 1991 determined that the primary offsite contaminants in the Regional Gravel Aquifer, which is the primary aquifer for local groundwater users, were TCE and Tc-99. Investigations of onsite source areas of TCE at the Paducah Site are ongoing. TCE has a low solubility and a higher density than water and is included in a chemical group referred to as dense nonaqueous-phase liquids. Because of these characteristics, TCE typically sinks through the subsurface and may form pools in less permeable layers of the subsurface, as well as in the base of an aquifer.

Groundwater monitoring locations sampled by DOE in 2022 and the known plume of TCE are shown on Figure 3-55 (DOE, 2025e). The overall extent of the TCE contamination is shown on Figure 3-55 (DOE, 2025e). The TCE contamination flows are generally north toward the river and not under the proposed GMPEF Site. Ranges of detected analytes in 2022 monitoring wells are shown in Table 3-8.



Source: DOE (2023)

Figure 3-54: DOE Nonradiological Surface Water and Seep Monitoring Locations with TCE Trends



Source: DOE 2025e, Figure 6.1 DOE (2023)

Figure 3-55: Monitoring Well with TCE Contamination

The release of per- and polyfluoroalkyl substances (PFAS) into the environment is a topic of growing public health and environmental concern. PFAS are a class of man-made chemicals that have been manufactured and used in a variety of industries since the 1940s. Since then, thousands of chemical formulations have been developed and are widely used in manufacturing and processing facilities due to their resistance to grease, water, oil, and heat. In 2022, the Paducah Site began a project to evaluate the presence of PFAS in environmental media, including potable water, at the site. Multiple PFAS were detected in Paducah Site potable water produced by DOE-owned water treatment plants, which source water from the Ohio River (DOE, 2025e).

Potable water sample results for perfluorooctanoic acid and perfluorooctanesulfonate exceeded the EPA provisional health advisory levels (0.004 nanograms per liter [ng/L] and 0.02 ng/L, respectively) and maximum contaminant level goals (i.e., 0 ng/L for both). Some results for perfluorooctanoic acid and perfluorooctanesulfonate exceeded the draft maximum contaminant levels (i.e., 4 ng/L). The Paducah Site potable water sample results are consistent with 2021 ambient concentrations reported by the Ohio River Valley Water Sanitation Commission for the Ohio River and as reported by a nearby municipal water supplier, Paducah Water Works, which also sources its water from the Ohio River at a location upstream of the Paducah Site intake. The Paducah Site potable water results, (which are similar to the PFAS concentrations in Ohio River water) and the Paducah Water Works results (which are similar to the Paducah Site result) indicate that the PFAS detections in Paducah Site potable water most likely originate from the Ohio River and are unrelated to the Paducah Site water treatment process and/or distribution system (DOE, 2025e). Thus, the GMPEF is likely to experience similar levels of PFAS whether it ultimately gets potable water from DOE or Paducah Water Works.

3.11.4 Historical Exposure to Radioactive Materials for PGDP

3.11.4.1 *Public Exposure*

For 2024, DOE has estimated the dose to the MEI member of the public as 1.4 mrem from operations and legacy contamination at the Paducah Site (DOE, 2025e). Historical values of MEI estimated doses for the last 10 years are included in Table 3-44. The significant increase shown from 2014 to 2015 was due to different calculation assumptions for the direct dose contribution with respect to the duration of members of the public being in proximity to higher dose areas close to the security perimeter of the DOE Paducah Site.

Table 3-44: Public and Occupational Radiation Exposure Limits

Exposure Group	Annual Dose Equivalent Limit	Reference
Worker	50 mSv (5 rem) TEDE 0.5 Sv (50 rem) CDE to any organ 0.15 Sv (15 rem) lens of eye 0.5 Sv (50 rem) skin 0.5 Sv (50 rem) extremity	NRC (10 CFR 20)
General Public	1 mSv (100 mrem) TEDE 0.02 mSv (2 mrem) in any 1-hour period	NRC (10 CFR 20)
	0.25 mSv (25 mrem) whole body 0.25 mSv (25 mrem) any organ 0.75 mSv (75 mrem) thyroid 0.04 mSv (4 mrem) CDE from drinking water	EPA (40 CFR 190) EPA (40 CFR 141.66d)

Key: CDE = committed dose equivalent; CFR = Code of Federal Regulations; EPA = Environmental Protection Agency; mrem = millirem(s); mSv = millisieverts; NRC = United States Nuclear Regulatory Commission; rem = roentgen equivalent man; Sv= sievert; TEDE = total effective dose equivalent

3.11.4.2 *Occupational Exposure*

There are currently no occupational activities conducted on the GMPEF Site that could result in exposure except for the UF_6 cylinder storage yard. As of September 2026, GeM is not responsible for these activities as the UF_6 cylinders on the GMPEF Site are owned and maintained by DOE.

3.11.5 Occupational Injury Rates and Occupational Fatality Rates

Due to its current use as forested buffer land, there are no ongoing, occupational activities conducted on the GMPEF Site except for occasional maintenance of the transmission line corridor. GeM is not responsible for these activities.

3.11.6 Summary of Health Effects Studies (for PGDP)

3.11.6.1 *Health Effects from Radiological Source Exposures*

Uranium may cause health effects in humans due to its chemical toxicity or its radioactive properties, and ingesting large amounts of uranium may damage the kidneys (ATSDR, 2013). Because the body has repair mechanisms against damage from radiation and chemical carcinogens, the biological effects of radiation on living cells may result in three outcomes: (1) injured or damaged cells repair themselves, resulting in no residual damage; (2) cells die, but are replaced through normal biological processes; or (3) cells incorrectly repair themselves, resulting in a biophysical change (NRC, 2024b).

Studies of the association between radiation exposure and cancer development are mostly based on populations exposed to high levels of ionizing radiation, such as survivors of the atomic bombs dropped on Japan and recipients of selected diagnostic or therapeutic medical procedures. Cancers associated with high-dose exposure (greater than 50,000 mrem [500 mSv]) include leukemia, breast, bladder, colon, liver, lung, esophagus, ovarian, multiple myeloma, and stomach cancers (NRC, 2024b).

The time between radiation exposure and detection of cancer is known as the latent period and can be many years. Cancers that are the result of radiation exposure are indistinguishable from those that occur naturally or as a result of chemical exposures. The National Cancer Institute suggests that other chemical and physical hazards and lifestyle factors significantly contribute to many of the same diseases. Although radiation may cause cancers at high doses, there are currently no data to unequivocally establish the occurrence of cancer following exposure to low doses and dose rates, i.e., below about 10,000 mrem (100 mSv) (NRC, 2024b).

Radiation exposure limits for the general public have been established by the NRC in 10 CFR Part 20 and by the EPA in 40 CFR Part 190. These limits are based on health-effects data from animal and human epidemiological studies. Exposure limits for the general public and occupational exposures are summarized in Table 3-44. The NRC limits the annual dose for individual members of the public on a total-effective-dose-equivalent basis to 100 mrem (1 mSv), which includes external plus internal radiation exposures, and a dose-equivalent rate of 2 mrem (0.02 mSv) in any 1-hour period in unrestricted areas accessible by members of the public who are not employees but who may be present at an enrichment facility (10 CFR 20.1301).

The annual whole body (25 mrem or 0.25 mSv), organ (25 mrem or 0.25 mSv), and thyroid (75 mrem or 0.75 mSv) dose-equivalent limits established by the EPA (40 CFR Part 190) apply to the general public who are at offsite locations at or beyond a plant's site boundary. The amount of exposure to the public at offsite locations due to routine operations at the GMPEF would comply with the more restrictive EPA limits.

The NRC standards also limit annual occupational radiation exposures to a total effective dose equivalent of 5 rem (0.05 sievert [Sv]), which includes external and internal exposure (10 CFR 20.1201). The NRC

standards further restrict the dose equivalent to the lens of the eye (15 rem [0.15 Sv]), skin (50 rem [0.5 Sv]), and extremities (50 rem [0.5 Sv]), and the committed dose equivalent to any internal organ (50 rem [0.5 Sv]) (10 CFR 20.1201).

3.11.6.2 *Health Effects from Chemical Source Exposures*

The most significant potential non radiological exposure hazard at the GMPEF Site is HF. UF_6 readily reacts with air, moisture, and other compounds to produce HF. Compounds including uranyl fluoride and small amounts of uranium tetrafluoride may also be produced (ATSDR, 2013). HF is a colorless, highly corrosive gas or liquid with a sharp, penetrating odor. HF can cause severe eye and respiratory irritation, necrosis, and edema, and ingestion of HF can result in vomiting, diarrhea, and circulatory collapse. Tissue burns and destruction can occur with contact to HF, and in large doses, HF's effects on the heart and lungs can result in death (ATSDR, 2003).

The EPA and the Occupational Safety and Health Administration have established exposure limits for HF. Recommendations regarding exposure to HF have also been established by the Agency for Toxic Substances and Disease Registry and the National Institute for Occupational Safety and Health. The American Conference of Governmental Industrial Hygienists also recommends exposure levels for HF. Table 3-45 summarizes EPA and Occupational Safety and Health Administration standards, as well as other Federal and State exposure guidelines.

Table 3-45: Hydrogen Fluoride Regulations and Guidelines

Agency	Description	Limit or Guideline
ACGIH	Short-term exposure limit (ceiling)	3.0 ppm
EPA	Accidental release prevention toxic endpoint	0.0160 mg/L
EPA	Accidental release prevention threshold quantity	1,000 lbs
EPA	Superfund – reportable quantity	5,000 lbs
NIOSH	Recommended exposure limit (TWA)	2.5 mg/m^3
NIOSH	Immediately dangerous to life and health	30 ppm
OSHA	Permissible exposure limit (8-hour TWA)	2.0 mg/m^3
OSHA	Highly hazardous chemicals threshold quantity	1,000 lbs

Source: ATSDR (2003).
Key: ACGIH = American Conference of Governmental Industrial Hygienists; EPA = Environmental Protection Agency; lbs = pounds; mg/L = milligrams per liter; mg/m^3 = milligrams per cubic meter; NIOSH = National Institute for Occupational Safety and Health; OSHA = Occupational Safety and Health Administration; ppm = parts per million; TWA = time-weighted average

3.12 Waste Management

This section of the ER typically would describe wastes that are generated at the site proposed for implementation of the Proposed Action. Because GeM has recently leased this property from DOE, GeM has no existing facilities at this site and is not generating any wastes. Disposal plans, waste minimization, and environmental impacts of the operations are discussed in Section 4.13, *Waste Management Impacts*.

3.12.1 Gaseous Waste and Wastewater

The GMPEF Site is located on approximately 100 acres of previously cleared land and 6.8 acres of presently undeveloped forested land. Developed areas within the site are limited to the UF_6 cylinder storage yard and high voltage transmission line. Therefore, there are no gaseous effluents, and no process or sanitary wastewaters generated at the GMPEF Site.

3.12.2 Solid Wastes

The GMPEF Site is located on approximately 100 acres of previously cleared land and 6.8 acres of presently undeveloped forested land. Developed areas within the site are limited to the UF_6 cylinder storage yard and high voltage transmission line. There may be small quantities of solid waste periodically generated by cylinder inspection activities and cylinder storage yard and transmission line maintenance activities. These wastes are managed by the agencies responsible for generating them and are not associated with the Proposed Action.

3.12.3 Remediation Activities

As part of site investigations related to leasing the land to GeM (DOE, 2025a), DOE performed a thorough review of records related to former use of the property. Based on a complete search of agency files, DOE is aware of no record showing the storage of the greater of 1,000 kilograms or a reportable quantity of any hazardous substance on the site; DOE is not aware of any release of any hazardous substance on the site in excess of a CERCLA reportable quantity; and DOE is not aware of any disposal of hazardous substances on the site. The leasehold includes two SWMUs. Both SWMUs (SWMU 409 and SWMU 530) have been designated for “no further action” (DOE, 2025a).

4.0 ENVIRONMENTAL IMPACTS

Impact analyses were performed for each of the resource areas described in Chapter 3.0, *Description of the Affected Environment*. These analyses and the predicted impacts are described for land use (Section 4.2); transportation (Section 4.3); geology and soils (Section 4.4); water resources (Section 4.5); occupational health (Section 4.12); and waste management (Section 4.13).

This chapter presents the impact analysis for the No Action Alternative and the three phases of the Proposed Action (construction, operation, and decommissioning). Under the No Action Alternative, a uranium-enrichment facility would not be constructed at the General Matter Paducah Enrichment Facility (GMPEF) Site. Therefore, the No Action Alternative would result in no additional impacts and this alternative is not discussed further. Cumulative impacts[4] for each resource are also discussed.

This Environmental Report (ER) uses the standard of significance established by the United States (U.S.) Nuclear Regulatory Commission (NRC) in Nuclear Regulatory Commission Report (NUREG)-1748 (NRC, 2003), which is used to define impacts as follows:

- SMALL: The environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
- MODERATE: The environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
- LARGE: The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

Under the NRC system, no or negligible impacts would be considered SMALL.

4.1 Comparison of Impacts: LEU vs HALEU Operations

In keeping with Congressional direction and the current administration's push for efficiency and smaller environmental documents, this section summarizes the differences in low-enriched uranium (LEU) and high-assay, low-enriched uranium (HALEU) operations that may result in changed impact ratings.

LEU is uranium enriched to less than 5 percent uranium-235 (U-235)—the main fissile isotope that produces energy during a chain reaction. HALEU is ''uranium having an assay greater than 5.0 weight percent and less than 20.0 weight percent of the uranium-235 isotope,'' 42 United States Code (U.S.C.) §16281(d)(4) (DOE, 2024a).

An enrichment facility can enrich any uranium feed stock to the desired level of enrichment. The facility is the same, the primary difference is the [redacted] (Trade Secret / Confidential Commercial Information). The higher the enrichment the more material [redacted] (Trade Secret / Confidential Commercial Information) and the higher the levels of security and criticality safety management due to the higher concentration of fissile isotopes. As a result, it is logical to infer that the potential environmental consequences of constructing and operating a facility capable of enriching uranium feed stock to both LEU and HALEU levels (i.e., GMPEF) would be the same as a LEU-only facility (DOE, 2025d). The only differences would be operational for physical security and criticality control. These include heightened levels of security and nuclear criticality safety management planning to address the radioactive handling of higher assays. Additionally, there are several key differences in operations to reach assays up to 20.0 weight percent U-235, including, [redacted]

[4] Cumulative impacts result from the incremental impact of an action when added to other actions. These other actions can include past, current, or reasonably foreseeable future actions.

[redacted] (Trade Secret / Confidential Commercial Information), more stringent packaging, tracking, and transportation requirements, and additionally regulatory procedures and handling requirements. Based on the presented differences, it is reasonable to assume that only Transportation and Public and Occupational Health would result in additional operational impacts. A comparison table of resource area impacts by LEU operations vs HALEU operations is presented in Table 4-1.

Table 4-1: Comparison of Resource Area Impacts Based on LEU vs HALEU Operational Impacts

Resource Area	Resource Area Impacts Based on LEU and HALEU Operations
Land Use	The same facilities will be used for both HALEU and LEU production. Differences are operational only. Therefore, there would be no Land Use differences.
Transportation	Transportation safety for HALEU requires more stringent transport and security regulations than LEU due to higher fissile content and smaller container sizes. HALEU has stricter subcriticality and security requirements, requiring specially designed, NRC-certified Type B packaging and armed escorts.
Geology and Soils	The same facilities will be used for both HALEU and LEU production. Differences are operational only. Therefore, there would be no Geology and Soils differences.
Water Resources	The same facilities will be used for both HALEU and LEU production. Differences are operational only. Therefore, there would be no Water Resources differences.
Ecological Resources	The same facilities will be used for both HALEU and LEU production. Differences are operational only. Therefore, there would be no Ecological Resources differences.
Meteorology, Climatology, and Air Quality	The same facilities will be used for both HALEU and LEU production. Differences would be operational only. Therefore, there would be no Meteorology, Climatology, and Air Quality differences.
Noise and Vibration	The same facilities will be used for both HALEU and LEU production. There would be no differences in noise and vibration impacts at the closest sensitive locations.
Historical and Cultural Resources	The same facilities will be used for both HALEU and LEU production. Differences are operational only. The selection of LEU and/or HALEU for operations would not cause adverse effects to historic properties.
Visual/Scenic Resources	The same facilities will be used for both HALEU and LEU production. Differences are operational only. Therefore, there would be no Visual/Scenic Resources differences.
Socioeconomic Environment	The same facilities will be used for both HALEU and LEU production. Differences are operational only. Therefore, there would be no Socioeconomic differences.
Public and Occupational Health	Public and Occupational Health safety for HALEU requires more stringent transport and security regulations than LEU due to higher fissile content and smaller container sizes. HALEU has stricter subcriticality and security requirements, requiring specially designed, NRC-certified Type B packaging and armed escorts.
Waste Management	The same facilities will be used for both HALEU and LEU production. Differences are operational only. No additional or different waste would be generated. Therefore, there would be no Waste Management differences.

Key: HALEU = high-assay low-enriched uranium; LEU = low-enriched uranium; NRC = United States Nuclear Regulatory Commission

4.2 Land Use Impacts

The land surrounding the GMPEF Site currently is zoned heavy industrial, which is the least restrictive of the land use designations under the McCracken County Zoning Ordinance. Tree-clearing activities have taken place on approximately 70 acres of the approximately 107-acre site as discussed in the Categorical Exclusion (CX) determination in *Site Preparation Including Tree Clearing (Parcel A) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (CX-270853). The Proposed Action would require tree clearing of 6.8 acres of presently undeveloped forested land. The remaining 30 acres were cleared prior to General Matter, Inc.'s (GeM's) lease and are now periodically mowed vegetation areas under the transmission line right-of-way (ROW). The existing land use at and around the GMPEF Site is described in Section 3.1, *Land Use*.

This section describes the potential land use impacts anticipated from the Proposed Action (Section 4.2.1). A description of the anticipated cumulative land use impacts assuming implementation of the Proposed Action is presented in Section 4.2.2, *Cumulative Impacts*. Measures to mitigate the land use impacts for the Proposed Action are discussed in Section 4.2.3, *Control of Impacts*. Land use impacts are considered for changes in land cover and zoning. The environmental impacts of clearing the land to build the GMPEF are evaluated in the appropriate sections of the ER including geology and soils (Section 4.4), water resources (Section 4.5), and ecological resources (Section 4.6). Those impacts are not considered land use impacts and therefore are not discussed in the land use section.

4.2.1 Proposed Action

The Proposed Action would construct and operate a uranium-enrichment facility at the GMPEF Site. Figure 1-3 shows the anticipated location of the GMPEF Site relative to the existing Paducah Site and other land use development in the vicinity. The Proposed Action would be consistent with the Paducah Site's current heavy industrial zoning classification.

4.2.1.1 *Construction*

Tree clearing activities have taken place on approximately 70 acres of the approximately 107-acre site as discussed in the CX determination in *Site Preparation Including Tree Clearing (Parcel A) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (CX-270853). The Proposed Action would require tree clearing of 6.8 acres of presently undeveloped forest. The remaining 30 acres of Parcel A were cleared and graded prior to GeM's lease and are now periodically mowed vegetation areas under the transmission line ROW. Structures built within the GMPEF Site would include the main GMPEF uranium enrichment building, [redacted] (Trade Secret / Confidential Commercial Information), radiological operations support building, a switchyard, and radiological laboratories. Other facilities that have previously been analyzed at the GMPEF Site, and may exist at the time of construction, include several administrative and other facility-support buildings, a parking lot, electrical substations, and outdoor uranium hexafluoride (UF_6) cylinder storage pads[5]. There will be a security fence around the security-controlled area. Existing high voltage transmission lines that currently traverse the GMPEF Site would be moved to the southern margins of the Site (see Figure A-5). Approximately 15 structures, to include 0.7 miles of transmission infrastructure and three circuits, would be moved to the southern border of the GMPEF Site (see Figure A-5). Transmission line relocation will remain within the property boundary and is not expected to have additional impacts on ecological resources.

[5] Certain site preparation and construction activities within the GMPEF Project Area have previously been analyzed in the *Environmental Assessment (EA) for General Matter's Site Preparation and Licensing Activities in Parcel A of the Paducah Site in McCracken County, KY* (DOE/EA-2327). This EA analyzed the environmental impacts to complete site preparation activities and to license, construct, operate, and eventually decommission essential radiological and nonradiological auxiliary facilities.

Site utilities for electric, water, and sewer service would need to connect to existing utilities along Hobbs Road and Dyke Road. GeM is pursuing potential options to connect access to the GMPEF Site from Hobbs Road, north of the intersection with Dyke Road.

Approximately 85 acres of soils at the GMPEF Site are considered to be prime farmland (if drained) and 7 acres of soil are considered farmland of state importance. These would be developed and therefore become unavailable for agricultural use under the Proposed Action. Consultation with the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) regarding compliance with the Farmland Protection Policy Act indicated that the farmland impact rating score would be lower than the mitigation threshold requirement for the development of the approximately 100-acre portion of the GMPEF Site (Parcel A) (USDA NRCS, 2026c). The 6.8-acre portion of the GMPEF Site (located within Parcel C) is considered a 'small acreage' and is therefore exempt from the Farmland Protection Policy Act (USDA NRCS, 2013).

The GMPEF and direct support structures would be located entirely on the GeM Site zoned heavy industrial. The majority of land on the GMPEF Site has previously been cleared, and the Proposed Action activities are consistent with heavy industrial zoning designations. Therefore, the land use impacts resulting from construction of the GMPEF would be SMALL.

4.2.1.2 *Operation*

Land would not be disturbed during operation of the GMPEF. Operation of a uranium-enrichment facility at the GMPEF Site would be consistent with the land use after construction (industrial manufacturing) and land use zoning classification (heavy industrial). This would also be consistent with the zoning for the adjacent properties that are all zoned heavy industrial. Therefore, the land use impacts resulting from operation of the GMPEF would be SMALL.

4.2.1.3 *Decontamination and Decommissioning*

At the end of operations, the GMPEF will be decontaminated and decommissioned (D&D) to reduce the remaining level of radioactivity to residual levels acceptable for release of the GMPEF for unrestricted use and for NRC license termination pursuant to Title 10 *Code of Federal Regulations* (10 CFR) 20.1401 ("General provisions and scope [Standards for Protections Against Radiation]") and 10 CFR 20.1402 ("Radiological criteria for unrestricted use [Standards for Protections Against Radiation]"). This would allow for future redevelopment of the land for another use consistent with the U.S. Department of Energy (DOE) owner and GMPEF Site's zoning designation, as designated by McCracken County (or the municipal government body with land use jurisdiction for the GMPEF Site in effect at the time of the facility closure); therefore, land use impacts resulting from the decommissioning of the GMPEF would be SMALL.

4.2.2 Cumulative Impacts

For construction, operation, and decommissioning, land use impacts resulting from the Proposed Action can be considered cumulative. After construction of the GMPEF, the area would function as an industrial site during the operating life of the GMPEF until the time of D&D.

As described in Section 2.4, *Cumulative Effects*, the DOE Paducah Site lies to the north of the GMPEF Site and there are several offsite projects scheduled to occur within the vicinity of the GMPEF. This includes the new Paducah Laser Enrichment Facility (PLEF) (GLE, 2025) proposed to be constructed adjacent to the GMPEF, and the turnover of areas to the east of the GMPEF Site for industrial development (DOE, 2025d). The GMPEF would add to the impacts of the existing DOE Paducah Site. If the proposed PLEF is constructed south of the GMPEF Site, that facility would also add to cumulative impacts. In addition, DOE is turning over the remaining 181 acres of Parcel C for industrial development. That land was originally part of the West Kentucky Wildlife Management Area (WKWMA), but was zoned for industrial development (DOE,

2025d). Therefore, existing and other planned land uses for the areas around the GMPEF Site, in addition with the land use impacts resulting from the Proposed Action, would be expected to result in MODERATE cumulative impacts to land cover.

Land use development at the GMPEF Site and the areas around the site are expected to be consistent with current McCracken County zoning regulations, land use plans, and infrastructure projects, as discussed in Section 3.1, *Land Use*. Therefore, zoning of the GMPEF Site and surrounding areas would remain heavy industrial and would have SMALL cumulative land use impacts.

4.2.3 Control of Impacts

Because the entire GMPEF Site must remain clear for facilities to be constructed, land use (i.e., land cover) mitigation measures would not be applicable for construction. Mitigation measures would not be needed during operations and decommissioning since there would be virtually no adverse land use impacts. Additionally, because the farmland conversion rating falls below the mitigation threshold, additional mitigations to address permanent conversion of prime farmland are not necessary. Potential land use impact mitigation measures for the GMPEF are also discussed in Section 5.1, *Land Use*.

4.3 Transportation Impacts

The GMPEF Site is located adjacent to and north of KY 725 (Woodville Road) generally between KY 1154 (Hobbs Road) on the west and Kelley Road on the east. KY 725 connects to U.S. Highway (U.S. Hwy) 60 (Hinkleville Road) via KY1154 (Hobbs Road) about 0.5 miles to the south-southwest of the Paducah Gaseous Diffusion Plant (PGDP) Site, providing connections to interstate highway access from the GMPEF Site to locations throughout the United States.

Based on U.S. Department of Transportation (DOT) road classifications and Kentucky traffic count maps, Woodville Road and Hobbs Road are minor rural collector roads. The area of U.S. Hwy 60 near the intersection of Hobbs Road is a principal rural arterial road that connects to Interstate (I-) 24 to the east of Paducah, Kentucky and ends in the west at the town of Wickliffe, Kentucky. Access to I-57 west of Wickliffe is provided by U.S. Hwy 51 and U.S. Hwy 62 in Illinois and Missouri, respectively (KYTC, 2025a).

Current traffic patterns at the Paducah Site vicinity are described in Section 3.2.2, *Paducah Site Transportation Access*. This section describes the potential transportation impacts projected to result from the No Action Alternative (Section 4.3.1) and the Proposed Action (Section 4.3.2). The potential radioactive material transportation impacts along possible routes used for shipment of these materials to and from the GMPEF Site are discussed in Section 4.3.3, *Radioactive Material Transportation Impacts*. A description of the projected cumulative transportation impacts for the GMPEF Site is presented in Section 4.3.4, *Cumulative Impacts*. Measures to mitigate the transportation impacts for the Proposed Action are discussed in Section 4.3.5, *Mitigation Measures* and Section 5.2, *Transportation*.

4.3.1 No Action Alternative

Under the No Action Alternative, a new uranium-enrichment facility would not be added to the Paducah Site. Additional motor vehicle traffic would not be expected to be added to the levels associated with the existing Paducah Site facilities. Existing stocks of UF_6 at the existing Paducah Site would continue to be stored and converted to uranium dioxide (or be delivered to other entities further afield by truck via DOE or offsite carriers). Transportation modes, routes, and destinations for the shipment of radioactive products and wastes from the Paducah Site would likely continue to follow the current transportation practices; therefore, there would be no additional impacts resulting from the No Action Alternative.

4.3.2 Proposed Action

Under the Proposed Action, a new uranium-enrichment facility would be added adjacent to the existing Paducah Site. Automobiles and trucks traveling to and from the GMPEF Site would use existing public roadways. In addition, UF_6 would potentially be transported directly between the two facilities via a private road or via Hobbs Road, mostly within the restricted access portion of the Paducah Site. Materials, supplies, and equipment used for construction, operation, and decommissioning of the GMPEF Site would be delivered by truck. Products and waste materials (solid and liquid) from GMPEF Site operations would also be shipped by truck. A new entrance from Hobbs Road would be used by motor vehicle traffic to the GMPEF Site (see Figure 1-4).

4.3.2.1 *Construction*

The number of construction workers at the GMPEF Site would vary during the construction period but is expected to be no more than 600 (one 10-hour shift per day, 6 days per week). During this period, traffic impacts would result from construction workers commuting to and from the GMPEF Site. Routes used by these workers to access the GMPEF Site would depend on where the workers reside. Workers living in eastern McCracken County near Paducah would likely travel westbound on U.S. Hwy 60 and exit on Hobbs Road north. Workers living in Ballard County to the west would likely travel eastbound on U.S. Hwy 60 and exit north on to Hobbs Road or approach Hobbs Road from eastbound Woodville Road. Workers living in communities directly south of the GMPEF Site in Carlisle or Graves County would likely travel north on U.S. Hwy 45, U.S. Hwy 51, or U.S. Hwy 62. The workers living to the north of the site in Illinois would likely cross the Ohio River on I-24 and approach the GMPEF Site from the east along U.S. Hwy 60.

A varying mix of heavy-duty, 18-wheeled tractor-trailer trucks; heavy-haul trucks (e.g., dump trucks, concrete-mixing trucks); and light-duty delivery trucks would travel to the GMPEF Site to deliver construction materials, supplies, and equipment for the GMPEF Site each day. In addition, visitors to the GMPEF Site (e.g., regulatory agency inspectors, GeM staff) and construction contractors would make a relatively small but variable number of automobile and pickup truck trips to and from the GMPEF Site during daily business and construction activity hours throughout the construction period.

The number of truck deliveries and the mix of truck types would vary on a given day depending on the stage of construction and types of construction activities. Heavy-duty trucks delivering materials from suppliers located beyond the general vicinity of the Paducah Site are expected to travel to the GMPEF Site via U.S. Hwy 60 and north on Hobbs Road. Trucks from local suppliers may travel to surface streets and access the GMPEF Site by traveling on Woodville Road and north on Hobbs Road. Consequently, during construction of the GMPEF, additional heavy-duty truck traffic on the main roadways in the Paducah Site vicinity is estimated to average approximately 40 trucks per day but would vary depending on the type and level of activity at the GMPEF Site (Appendix A, *Facility Description*).

Construction workers and truck drivers would likely access the GMPEF Site through the entrance from Hobbs Road, with DOE approval, which would also be used by workers and other motor vehicle traffic associated with the existing PGDP. There are currently no residences along Hobbs Road from Kentucky (KY) 725 (Woodville Road) and approximately five residences along Hobbs Road between U.S. Hwy 60 and Woodville Road. Air quality, noise, and scenic impacts associated with the construction traffic for the GMPEF Site are discussed, respectively, in Section 4.7, *Air Quality Impacts*, Section 4.8, *Noise and Vibration Impacts*, and Section 4.10, *Visual/Scenic Resources Impacts*.

Transportation impacts associated with construction of the GMPEF Site would be temporary and variable over the period needed to build the GMPEF. On a day-to-day basis, the total vehicle trips to the GMPEF Site would be expected to vary significantly depending on the type of construction activities being conducted and the number of workers required for those activities (e.g., clearing and grading the GMPEF

Site, erecting the building structures, installing utilities, finishing building interiors, installing equipment inside building). Projections of the Average Daily Traffic (ADT) based on the annual average number of construction workers required for construction of the GMPEF Site are presented in Table 4-2.

Table 4-2: Projected Vehicle Trips Generated by the GMPEF Site

Phase	Year	Average Annual Number of Employees [a]	Total Vehicle Trips [b, c]	
			a.m. Peak Hour Trips	ADT
Construction activities	2025–2028	600 [d]	200 [e]	500
Production operation	2028–2068	140 [f]	75 [f]	310
Production Operation (license Extension: two 20 years)	2068–2108	140 [f]	75 [f]	310
Production operation and initial decommissioning activities	2109–2110	280 [g]	196 [e, h]	588
Decommissioning	2111–2114	140 [g]	140 [e]	294

Key: ADT = Average Daily Traffic; GMPEF = General Matter Paducah Enrichment Facility; ITE = Institute of Transportation Engineers;

Notes:

[a] Average annual number of employees during the specified years (Appendix A, *Facility Description*).

[b] Number of vehicle trips estimated using ITE standard trip generation rates for industrial manufacturing land use (ITE, 2021). The ITE defines manufacturing facilities as areas where the primary activity is the conversion of raw material or parts into finished products. The ITE trip generation rates are total vehicle rates that include trucks. a.m. peak hour trips = 0.4 per employee. ADT = 2.1 per employee. (GLE, 2025).

[c] Assumed ITE ADT trip generation rates for industrial manufacturing land use for all phases.

[d] Actual total number of construction workers on site on a given day would vary depending on the GMPEF's construction stage and required activities. On many days, fewer than 200 workers used for the ADT estimate are expected to be needed to perform the required daily construction activities.

[e] Assumed construction and decommissioning activities conducted only during daylight hours on a Monday through Friday schedule. Therefore, a.m. peak hour trip estimates conservatively assume that all workers work the same schedule and arrive at the GMPEF at the same time.

[f] The operation would consist of four groups of 25 workers to cover three rotating shifts, and 40 corporate staff working Monday–Friday day shift (Appendix A, *Facility Description*). The same number of workers was assumed to be applicable during the license extension.

[g] The number of workers (280) included in the ADT estimate is anticipated to be an upper limit. The actual total number of decommissioning workers on site on a given day could vary depending on the specific decommissioning-phase activities.

[h] 196 a.m. peak hour trips for production workers includes + 140 a.m. peak hour trips for decommissioning workers.

Because most of the automobile and truck traffic to the GMPEF Site is expected to exit off U.S. Hwy 60, the most concentrated traffic impacts would likely occur along the approximately 0.5-mile (0.8 kilometer) segment of Hobbs Road just north of U.S. Hwy 60. The most recent (2024) Average Annual Daily Traffic counts for traffic on Hobbs Road in the vicinity of the Paducah Site is 1,796 vehicles per day (see Section 3.2.2.1, *Existing Transportation Routes and Traffic Patterns*, and Figure 3-5) (KYTC, 2025b). The projection of up to 240[6] ADT being added to the current Average Annual Daily Traffic levels for the segment of Hobbs Road in the immediate vicinity of the intersection with U.S. Hwy 60 could have some adverse impact on the traffic flow and increase the potential for traffic congestion at the Hobbs Road and U.S. Hwy 60 intersection during peak commuting hours; therefore, transportation impacts for construction of the GMPEF Site on a local basis are anticipated to be MODERATE. Aside from the Hobbs Road and U.S. Hwy 60 intersection, many GMPEF Site employees who are traveling from Illinois or northern sections of Paducah could use I-24 to the Cairo Road/Woodville Road corridor, bypassing

[6] Two hundred construction workers (assuming each uses their own vehicle, as a conservative assumption) and 40 truck shipments per day (Appendix A, *Facility Description*)

additional traffic on Hobbs Road near U.S. Hwy 60; therefore, the transportation impacts for construction of the GMPEF Site on a regional basis would be SMALL.

4.3.2.2 *Operation*

Operation of the GMPEF Site would add to the number of workers already commuting to and from the existing Paducah Site. As discussed in Section 4.11.1, *Proposed Action*, during GMPEF Site's initial start-up operations, onsite workers would include temporary construction workers and additional GMPEF Site personnel. After the GMPEF Site start-up operations conclude, a permanent workforce of approximately 140 workers (100 shift workers and 40 corporate staff) would be used for GMPEF Site production operations for the lifetime of the GMPEF. Routes used by these workers would depend on where the workers reside and are expected to be the same as those used by the construction workers (described in Section 4.3.2.1, *Construction*). Because the GMPEF Site would operate on multiple (four) shift schedules 24 hours per day and 7 days per week (Appendix A, *Facility Description*), not all of these workers would be on site each day and during the same time period. Peak traffic volumes entering and exiting the GMPEF Site would occur during a shift change.

GMPEF Site operations would also result in additional vehicle traffic entering and exiting the Paducah Site at various times throughout the day and possibly at night. The natural uranium materials that would potentially be used for feed to the enrichment process (i.e., UF_6 feed) would be shipped to the GMPEF Site by trucks across the Ohio River from the Honeywell UF_6 Conversion Facility about 18 miles (31 kilometers) away. Depleted uranium materials used for feed to the enrichment process would be transported from the existing Paducah Site to the GMPEF Site via Hobbs Road or Dyke Road, which is on PGDP property, and returned via the same route. Enriched uranium produced at the GMPEF Site (i.e., UF_6 product) and the depleted uranium (i.e., UF_6 tails) generated as a by-product of GMPEF Site operations would be shipped off site by truck. The GMPEF Site would provide a new source of enriched UF_6 for nuclear fuel fabricators and, consequently, increase the number of truck shipments of enriched UF_6 off site to a level comparable to the number of shipments when the Paducah Site was operating. Transportation modes, routes, and packaging used for radioactive material shipments associated with GMPEF Site operations are discussed further in Section 4.3.3, *Radioactive Material Transportation Impacts*. Trucks would also deliver other supplies and equipment to the GMPEF Site on a regular basis.

In addition to truck shipments, occasional automobile trips to and from the GMPEF Site would be made by visitors to the GMPEF Site (e.g., regulatory inspectors) and GMPEF Site engineering and other staff; however, because access to the GMPEF Site would be restricted to authorized personnel only, these vehicle trips are expected to be limited in number.

It is estimated that there would be an additional 1,500 heavy-duty truck shipments per year to or from the GMPEF Site once it is operating at full production capacity (five truck shipments per day, on average). Most of this traffic is expected to use U.S. Hwy 60, with the remainder of the traffic using Woodville Road if it is ultimately traveling north.

Projections of the ADT generated by GMPEF Site operations are presented in Table 4-2. Once the operation starts, the number of daily vehicle trips generated by GMPEF Site operations are projected to be in the range of 310 ADT until initial decommissioning activities commence, when the projected ADT would increase to 588 for a 2-year period that overlaps with operations. The addition of a projected 294 to 588 ADT for GMPEF Site operations and decommissioning could adversely impact the segment of Hobbs Road in the immediate vicinity of the intersection with U.S. Hwy 60. Adding this magnitude of ADT to the current AADT levels for the segment of Hobbs Road near the intersection of U.S. Hwy 60 would noticeably increase the traffic volumes on the road and increase the potential for traffic congestion at the intersections of Hobbs Road and Woodville Road and Hobbs Road and U.S. Hwy 60 during peak commuting

hours; therefore, transportation impacts for GMPEF Site operations on a local basis are anticipated to be MODERATE.

U.S. Hwy 60 and the Woodville Road/Cairo Road corridor connect directly to I-24, providing continuous interstate highway access from the GMPEF Site to locations throughout the United States. The entrance to the GMPEF Site from Hobbs Road would be located within approximately 9–11 miles (15–18 kilometers) of an interchange with I-24, therefore, transportation impacts for the GMPEF Site operations on a regional basis would be SMALL.

4.3.2.3 *Decontamination and Decommissioning*

The plans for decommissioning of the GMPEF Site are described in Section 2.1.2.1.3, *Decontamination and Decommissioning*. The number of onsite workers required during decommissioning of the GMPEF Site once production ceases is approximately 200 workers. This is the same number of workers that is projected for the facility's construction (Appendix A, *Facility Description*). Decommissioning of the GMPEF Site would include the decontamination and removal of equipment and other materials for shipment off site. The number of truck shipments will depend on the quantities of used equipment and waste materials resulting from decommissioning. It is expected that the average number of truck shipments would be similar to the average daily truck traffic during the initial 2 years of construction. Projected ADT for the GMPEF Site during decommissioning are presented in Table 4-2. The reduction in the number of onsite workers over time would result in a corresponding reduction in the number of ADT on Hobbs Road, U.S. Hwy 60, and other connecting roadways, e.g., Woodville Road/Cairo Road corridor.

Radioactive-contaminated equipment and materials removed during decommissioning that require offsite disposal would be shipped to a licensed treatment or disposal facility (as appropriate for the material type) or disposed of in a manner authorized by the NRC. The transport of these shipments would comply with applicable NRC and DOT requirements in effect at the time of facility closure. These truck shipments would occur over the time period anticipated to complete the decommissioning activities. The number of truck trips from the GMPEF Site, the destinations for those trips, and the routes used to travel to those destinations would depend on the quantities and types of equipment and demolition material shipped off site, as well as the locations of the treatment and disposal facilities open and with capacity to receive the shipments at the time that decommissioning would begin.

The transportation impacts associated with decommissioning of the GMPEF Site would be temporary and variable over the decommissioning period for the GMPEF Site. Given the significant reduction in the number of onsite workers, the level of expected truck traffic, the relatively short duration for many of the expected decommissioning activities, and the continued transportation corridor improvements likely to have been made to the Paducah area by the date that the GMPEF Site permanently ceases production, transportation impacts of the Proposed Action during decommissioning are anticipated to be SMALL.

4.3.3 Radioactive Material Transportation Impacts

4.3.3.1 *Radioactive Material Treatment and Packaging for Transportation*

Regulation of the shipment of radioactive materials associated with operation of the GMPEF is under the joint jurisdiction of the NRC and the DOT. The NRC establishes requirements for the design and manufacture of packages for radioactive materials, whereas the DOT regulates the shipments while they are in transit and sets standards for labeling and for package size. The radioactive material shipment requirements established by these Federal agencies are codified in 10 CFR 71 (*Packaging and Transportation of Radioactive Material*) and 49 CFR Part 173 (*Shipper – General Requirements for Shipments and Packagings*). The current criteria for packaging of UF_6 for transport adopted by the NRC and DOT are established by the American National Standards Institute (ANSI) in ANSI N14.1 (*For Nuclear*

Materials – Uranium Hexafluoride – Packagings for Transport) (ANSI, 2023). This standard includes specific information on design and fabrication requirements for the procurement of new UF_6 containers.

Types of packaging to be used for shipping radioactive materials to and from the GMPEF Site are summarized in Table 4-3. There are two main sizes of approved containers used for transport of UF_6: 30-inch diameter cylinders (for the enriched uranium above 1 percent U-235) and 48-inch diameter cylinders (for the natural and depleted uranium). UF_6 is shipped at ambient temperatures and remains in solid form during transport, thereby enhancing its stability and safety while in transit. The 48G, 48X, and 48Y cylinders are generally used to carry either UF_6 feed or depleted uranium hexafluoride (DUF_6) tails. The 48G cylinders are primarily used to carry DUF_6 tails (Appendix A, *Facility Description*). The 48X, 48Y, and 48G containers are each approximately 48 inches (122 centimeters) in diameter but have different lengths, wall thickness, and corresponding UF_6 fill capacities. The 48X cylinder can hold approximately 10.5 tons (9.5 metric tons) of UF_6, whereas the larger 48Y and 48G cylinders can hold approximately 13.7 tons (12.4 mt) and 13.4 tons (12.2 mt) of UF_6, respectively. The 30B and 30B-10 cylinders are the principal containers used to carry enriched UF_6 products (Appendix A, *Facility Description*). These containers are approximately 30 inches (76 centimeters) in diameter. The 30B can hold approximately 2.5 tons (2.3 mt) of UF_6 (ANSI, 2023) and the 30B-10 can hold approximately 1.6 tons (1.5 mt) of UF_6. The 30B cylinders within their protective structure packages are used to transport enriched uranium hexafluoride.

Table 4-3: Packaging for GMPEF Site Radioactive Materials Shipments

Material Type	Packaging Type	Container Dimension	Container Waste Capacity	Typical Truck Shipment
Natural UF_6 feed	48Y cylinder [a, b]	48 inch diameter (122 centimeter diameter)	13.7 tons (12.4 MT)	One cylinder per truckload
Enriched UF_6 products	30B cylinder [a]	30 inch diameter (76 centimeter diameter)	2.5 tons (2.3 MT)	Five cylinders per truckload
DUF_6	48Y cylinder [a]	48 inch diameter (122 centimeter diameter)	13.7 tons (12.4 MT)	One cylinder per truckload
LLRW	Type A containers [c] as appropriate for the waste type (e.g., combustible, noncombustible) and waste form (e.g., solid, semi-solid, liquid)	Various size containers as appropriate for waste	Various capacity containers as appropriate for waste	Sufficient number of containers to make a full tractor-trailer load

Key: ANSI = American National Standards Institute; CFR = Code of Federal Regulations; DUF_6 = depleted uranium hexafluoride; ER = Environmental Report; GMPEF = General Matter Paducah Enrichment Facility; LLRW = low-level radioactive waste; MT = metric tons of UF_6; NRC = United States Nuclear Regulatory Commission; UF_6 = uranium hexafluoride; U.S. = United States

Notes:

[a] Cylinder designation established by ANSI in ANSI N14.1, *For Nuclear Materials – Uranium Hexafluoride – Packagings for Transport* (ANSI, 2023).

[b] Other 48-inch cylinders could be used. However, for analysis purposes in this ER, the 48Y cylinders were considered, as these would contain the highest possible mass of UF_6.

[c] Packaging requirements for Type-A containers as established by the NRC in 10 CFR Part 71, *Packaging and Transportation of Radioactive Materia*l, and U.S. Department of Transportation in 49 CFR Part 173, *Shippers – General Requirements for Shipments and Packagings*.

The GMPEF would enrich Depleted-up-to-Natural UF_6, and natural UF_6 to LEU, and LEU to HALEU. It is estimated that on an annual basis, these two facilities would need 1,146 truck shipments of DUF_6 and 312 shipments of natural UF_6. The GMPEF would generate about 1,185 truck shipments of DUF_6 tails and 34

truck shipments of LEU. The DUF_6 enrichment facility would generate equivalent of 242 shipments of natural UF_6 that then can be fed to the LEU enrichment facility; thereby reducing the need for natural UF_6 to 70 shipments.

The low-level radioactive wastes (LLRWs) that would be generated by the GMPEF Site are discussed in Section 4.13.1.2.2.4, *Low-Level Radioactive Wastes Management*. Federal regulations in 10 CFR 61 (*Licensing Requirements for Land Disposal of Radioactive Waste*) define three classes of LLRW based on the specific radioactive isotopes present, their concentrations, and their half-lives. Packaging requirements are established in 10 CFR Part 71 and 49 CFR Part 173 for each of the three LLRW classes (designated Class A, B, and C). Class-A LLRW has the lowest concentration of radioactive material and poses the least potential hazard. The composition of LLRW generated by the GMPEF Site would be Class-A wastes. These LLRWs would be packaged in approved Type-A containers as appropriate for the waste type (e.g., combustible, noncombustible) and waste form (e.g., solid, semi-solid, liquid). No Class B or Class C radioactive waste is expected to be generated at the GMPEF Site.

4.3.3.2 *Transportation Modes, Routes, and Distances*

On a national basis, new origins and destinations for radioactive material shipments to and from the GMPEF Site would be added to the current mix of shipping locations. This situation would approximately be similar to the number of radioactive material shipments experienced from the Paducah Site when it was in operation. The DUF_6 would be shipped to the GMPEF by trucks from the neighboring Paducah Site, and natural uranium UF_6 from conversion facilities in the United States (e.g., Metropolis, Illinois), which is about 19 miles (30 kilometers) away; from Canada; and, possibly, from east coast or southern seaports where the material would be received from foreign suppliers. The enriched UF_6 product would be shipped off site to nuclear fuel manufacturing facilities. It is planned that the DUF_6 tails would be returned to one of the DUF_6 storage facilities at DOE sites such as the PGDP or Portsmouth Sites or to another commercial DUF_6-conversion facility, should one become available, as discussed in Section 4.13.1.2.2.7, *Offsite DUF_6 Management*. Until such time that the DUF_6 tails can be shipped off site to other facilities for further processing and ultimate disposal, they would be stored on site as discussed in Section 4.13.1.2.2.6, *Onsite DUF_6 Management*. LLRW generated by GMPEF Site operations are planned to be shipped to the Energy*Solutions* disposal facility in Clive, Utah, as discussed in Section 4.13.1.2.2.5, *Low-Level Radioactive Wastes Management*.

The transportation modes, routes, and distances for radioactive materials delivered to and shipped from the GMPEF Site are summarized in Table 4-4. Heavy-duty, 18-wheel diesel trucks would be used to transport the materials. The UF_6 feed and DUF_6 tails would be transported in 48Y (or other 48-inch [122-centimeters]) cylinders. Typically, one 48Y cylinder would be transported per truckload. The enriched UF_6 product would be transported in 30B cylinders with future consideration for 30B-X (for higher enrichment than 5 percent), typically within Type B overpacks, such as UX-30 (CoC: USA/9196/B(U)F-96); or DN30-X (CoC: USA/9388/AF-96), as a protective structural casing in which the cylinder is placed. For truck transport to facility locations in the United States, five 30B overpacked cylinders would be transported on each truck.

Table 4-4: Route Characteristics for the GMPEF Site Radioactive Materials Shipments

Radioactive Material	Facility [a]	Transportation Route Distance [b] Miles (kilometers)			Population Density Number/square mile (number/square kilometer)		
		Rural	Suburban	Urban	Rural	Suburban	Urban
UF_6 feed	U.S. Department of Energy Depleted UF_6 facility Paducah, Kentucky	0.6 (1)	0	0	Note-1	Note-1	Note-1
	Portsmouth Marine Terminal [c] Portsmouth, Virginia	504 (812)	309 (498)	16 (26)	84 (32)	1,223 (472)	5,991 (2,314)
	Dundalk Marine Terminal [c] (Port of Baltimore) Baltimore, Maryland	491 (790)	354 (570)	22 (35)	89 (34)	1,243 (480)	5,595 (2,161)
	Honeywell International UF_6 conversion facility Metropolis, Illinois	11 (18)	8 (13)	0	52 (20)	755 (292)	0
	Canada (Cameco) UF_6 conversion facility Port Hope, Ontario, Canada [d]	565 (908)	252 (406)	26 (42)	55 (21)	1,073 (414)	4,293 (1,658)
UF_6 product	Global Nuclear Fuels – America (GNFA) Fuel fabrication facility Wilmington, North Carolina	428 (689)	370 (595)	19 (31)	89 (34)	1,474 (569)	5,677 (2,193)
	Westinghouse Electric Co. Fuel fabrication facility Columbia, South Carolina	382 (615)	209 (336)	14 (23)	79 (30)	1,380 (533)	5,541 (2,140)
	Framatome Fuel fabrication facility Richland, Washington	1,774 (2,854)	363 (583)	32 (51)	47 (18)	1,406 (543)	5,487 (2,119)
	USNC Fuel Fabrication Facility Oak Ridge, Tennessee	216 (347)	90 (145)	4 (6)	64 (25)	1,515 (585)	5,366 (2,073)
DUF_6 tails	U.S. Department of Energy Depleted UF_6 facility Paducah, Kentucky	0.6 (1)	0	0	Note-1	Note-1	Note-1
	U.S. Department of Energy Depleted UF_6 facility Portsmouth, Ohio [e]	370 (597)	179 (288)	4 (6)	61 (24)	981 (378)	4,920 (1,901)

Table 4-4: Route Characteristics for the GMPEF Site Radioactive Materials Shipments

Radioactive Material	Facility [a]	Transportation Route Distance [b] Miles (kilometers)			Population Density Number/square mile (number/square kilometer)		
		Rural	Suburban	Urban	Rural	Suburban	Urban
Empty cylinders (returned to UF_6 conversion facility)	Honeywell International UF_6 conversion facility [f] Metropolis, Illinois	11 (18)	8 (13)	0	52 (20)	755 (292)	0
LLRW	Energy*Solutions* LLRW disposal facility Clive, Utah	1,328 (2,136)	302 (486)	42 (67)	43 (17)	1,488 (575)	6,235 (2,409)
LLRW	WCS Andrews County, Texas [g]	1,408	550	50	14	444	2,859

Key: DOE = United States Department of Energy; DUF_6 = depleted uranium hexafluoride; GNFA = Global Nuclear Fuels – America; GMPEF = General Matter Paducah Enrichment Facility; LLRW = low-level radioactive waste; U.S. = United States; UF_6 = uranium hexafluoride; USNC = Ultrasafe Nuclear Corporation; WCS = Waste Control Specialists

Notes:

[a] Facility shipping material to or receiving material from GMPEF as applicable to material type. Rural, suburban, and urban areas are characterized according to the following breakdown: rural population densities range from 0 to 54 persons per square kilometer (0 to 139 persons per square mile); suburban densities range from 55 to 1284 persons per square kilometer (140 to 3,326 persons per square mile); and urban covers all population densities greater than 1,284 persons per square kilometer (3,326 persons per square mile).

[b] Route distances and populations along routes estimated using DOE Transportation Routing Analysis Geographic Information System (Web-TRAGIS). All values are rounded.

[c] Potential receiving seaport for shipments from foreign natural UF_6 feed suppliers.

[d] The segments distances and population densities are those affected within the United States.

[e] The DUF_6 transport to Portsmouth, Ohio, could occur on commercially accepted hazardous roads, however, for the conservatism it was assumed to follow restrictions as applied for the highway route-controlled quantities hazardous wastes transport regulations.

[f] Assumed for the impact assessment that returning the empty cylinders to a facility within United States would be the typical practice used for the GMPEF.

[g] Source: (DOE, 2020)

[1] The DUF_6 transport as a feed to the GMPEF would occur within the DOE Paducah Site restricted areas, and there are no members of the general public within the vicinity (0.5 mile) of the road.

For offsite transport, highway routes were determined using the routing program Web-TRAGIS (Peterson, 2018). The features in Web-TRAGIS allow users to determine routes for shipment of radioactive materials that conform to DOT regulations as specified in 49 CFR Part 397 ("highway route-controlled quantities"). The population densities along each route were derived from 2010 Census Bureau data (Peterson, 2018). Many of the shipment's routes determined by the Web-TRAGIS evaluated for this ER, such as shipments of the radioactive wastes to disposal facilities follow the DOT transport routing regulations as those for highway route-controlled quantities; therefore, all shipments of radioactive materials and wastes are considered to fall in this category. The routes were selected to be reasonable and consistent with routing regulations and general practice, but they are representative routes only because the actual routes would be chosen in the future. At the time of shipment, the route would be selected on the basis of current road conditions, weather conditions, and traffic congestion. State-level U.S. Census data for 2010 (U.S. Census Bureau, 2010) was used in relation to the 2020 census data (U.S. Census Bureau, 2020a) to project the population densities to 2050 levels (mid operational period; e.g., 2028 to 2068).

In general, the likely route for radioactive material shipments to and from the GMPEF Site (see Figure 3-5) would be Hwy 60 east to I-24. Trucks would travel from the originating facilities or to destination

facilities via other interstate highway connections. The DUF_6 is expected to be received from the neighboring Paducah Site, although it could be received from a combination of different suppliers. The enriched UF_6 products may be shipped to several different customers. Table 4-4 presents estimated distances and the associated projected population densities from the GMPEF Site to the radioactive material shipment origination and destination facilities that would or potentially could be associated with GMPEF operations.

4.3.3.3 *Radiological Doses for Incident-Free Transport*

Incident-free transport means that radioactive material is transported without a traffic accident or other incident, resulting in no release of radioactive material to the environment. The radiological dose a person is exposed to as a result of materials being transported incident-free to and from the GMPEF Site is dependent on several factors, including the external radiation levels of the package being transported, distance from the package to the exposed individual, exposure time per shipment, and number of shipments individuals are exposed to over a time period (i.e., shipments per year).

The predicted radiological doses to the public and workers from incident-free transport of radioactive materials during GMPEF operations were calculated with RADTRAN V6.02.1 (Sandia National Laboratories, 2013) for a selection of shipment scenarios. The GMPEF would receive shipments of natural UF_6 feed, as well as Depleted DUF_6 and would send shipments of enriched UF_6 product, DUF_6 tails, and LLRW to other facilities. Table 4-5 presents the predicted incident-free per shipment and annual radiological doses for shipment scenarios defined for each of the facilities identified in Table 4-4 using the conservative assumption that the entire annual shipment of the applicable radioactive material type (e.g., UF_6 feed, UF_6 product, DUF_6 tails, LLRWs) is received from or sent only to the identified facility. As stated above, for each scenario, the route information and public population density along the route within the United States were generated using Web-TRAGIS. The shipments from Canada would enter the United States through Niagara Falls, New York, where it is considered to be the origin for the transport, similar to the assumptions for feed materials transported from the port of entries that were considered for the natural UF_6 shipments from overseas. All of the scenarios assume that the materials are shipped by truck with a two-person crew. Other important RADTRAN model input assumptions are noted in Table 4-5.

Table 4-5 shows the radiological dose estimates in person-Sieverts (Sv) and person-Sv/year. The radiological dose per shipment estimates show a range of in-transit general population dose-equivalent exposures, from 7.0×10^{-07} (for the natural UF_6 feed shipments from Metropolis, Illinois) to 1.1×10^{-3} (for the LEU transports to Richland, Washington) person-Sv (7.1×10^{-5} to 1.1×10^{-1} person-roentgen equivalent man). These exposures are dependent on various parameters such as the type of material shipped and the shipment's destination. Specifically, on annual basis, the radiological dose estimates show a range of in-transit general population dose-equivalent exposures, from 4.9×10^{-05} (for the natural UF_6 feed shipments from Metropolis, Illinois) to 3.9×10^{-2} (for the LEU transports to Richland, Washington) person-Sv (4.9×10^{-3} to 3.9 person-roentgen equivalent man). The scenario radioactive packaging and shipment assumptions are provided in Table 4-6.

Table 4-5: Radiological Doses Estimated for GMPEF Site Radioactive Material Incident-Free Truck Shipment Scenarios

Shipment Scenario [a]		Exposure per Truck Shipment [b] (person-Sv)				Annual Exposure [c] (person-Sv/year)			
		In-Transit General Population Exposure [d]	In-Transit Truck Crew Exposure [e]	Worker Handling Exposure [f]	Bystander Rest Stop Exposure [g]	In-Transit General Population Exposure	In-Transit Truck Crew Exposure	Worker Handling Exposure	Number of Shipments
Shipment of UF_6 feed to GMPEF Site	U.S, Department of Energy Depleted UF_6 facility Paducah, Kentucky [h]	0	8.4×10^{-9}	3.4×10^{-5}	0	0	9.6×10^{-6}	3.9×10^{-2}	1,146
	Marine terminal Portsmouth, Virginia	3.6×10^{-5}	7.4×10^{-6}	3.4×10^{-5}	3.1×10^{-6}	2.5×10^{-3}	5.2×10^{-4}	2.4×10^{-3}	70
	Marine terminal Baltimore, Maryland	4.1×10^{-5}	8.0×10^{-6}	3.4×10^{-5}	3.1×10^{-6}	2.9×10^{-3}	5.6×10^{-4}	2.4×10^{-3}	70
	Honeywell International Metropolis, Illinois	7.0×10^{-7}	1.7×10^{-7}	3.4×10^{-5}	3.1×10^{-6}	4.9×10^{-5}	1.2×10^{-5}	2.4×10^{-3}	70
	Cameco Port Hope, Ontario, Canada	3.7×10^{-5}	7.2×10^{-6}	3.4×10^{-5}	3.1×10^{-6}	3.6×10^{-3}	5.0×10^{-4}	2.4×10^{-3}	70
Shipment of UF_6 product in 30B cylinders to fuel fabrication facility	USNC Fuel Fabrication facility Oak Ridge, Tennessee	1.7×10^{-4}	3.9×10^{-5}	2.0×10^{-4}	6.4×10^{-5}	5.8×10^{-3}	1.3×10^{-3}	6.9×10^{-3}	34
	GNF-A Wilmington, North Carolina	5.1×10^{-4}	1.2×10^{-4}	2.0×10^{-4}	6.4×10^{-5}	1.7×10^{-2}	4.1×10^{-3}	6.9×10^{-3}	34
	Westinghouse Electric	3.6×10^{-4}	8.1×10^{-5}	2.0×10^{-4}	6.4×10^{-5}	1.2×10^{-2}	2.8×10^{-3}	6.9×10^{-3}	34

Table 4-5: Radiological Doses Estimated for GMPEF Site Radioactive Material Incident-Free Truck Shipment Scenarios

Shipment Scenario [a]		Exposure per Truck Shipment [b] (person-Sv)				Annual Exposure [c] (person-Sv/year)			
		In-Transit General Population Exposure [d]	In-Transit Truck Crew Exposure [e]	Worker Handling Exposure [f]	Bystander Rest Stop Exposure [g]	In-Transit General Population Exposure	In-Transit Truck Crew Exposure	Worker Handling Exposure	Number of Shipments
	Columbia, South Carolina								
	Framatome Richland, Washington	1.1×10^{-3}	2.4×10^{-4}	2.0×10^{-4}	6.4×10^{-5}	3.9×10^{-2}	8.1×10^{-3}	6.9×10^{-3}	34
Shipment of UF_6 tails to conversion facility	U.S. DOE Portsmouth, Ohio	2.0×10^{-5}	4.6×10^{-6}	3.4×10^{-5}	3.1×10^{-6}	2.4×10^{-2}	5.4×10^{-3}	4.0×10^{-2}	1,185
	U.S. DOE [h] Paducah, Kentucky	0	8.4×10^{-9}	3.4×10^{-5}	0	0	1.0×10^{-5}	4.0×10^{-2}	1,185
Return of empty cylinders [i]	Honeywell International Metropolis, Illinois	1.4×10^{-5}	5.5×10^{-6}	3.3×10^{-4}	1.0×10^{-4}	4.8×10^{-4}	1.9×10^{-4}	2.1×10^{-3}	35
Shipment of LLRW for disposal [j]	Energy*Solutions* Clive, Utah	1.3×10^{-4}	8.9×10^{-5}	2.9×10^{-5}	9.0×10^{-6}	4.7×10^{-3}	3.2×10^{-3}	1.0×10^{-3}	36

Key: DOE = United States Department of Energy; DUF_6 = depleted uranium hexafluoride; GMPEF = General Matter Paducah Enrichment Facility; GNF-A = Global Nuclear Fuel – Americas; LLRW = low-level radioactive wastes; Sv = sievert; U.S. = United States; UF_6 = uranium hexafluoride; USNC = Ultra Safe Nuclear Corporation

Notes:

[a] See Table 4-6 for packaging and shipment assumptions.

[b] Dose exposures calculated using RADTRAN 6.02.1 computer model.

[c] Annual dose is the collective dose assuming that the total annual number of shipments for the indicated material is shipped to the facility (RADTRAN estimated dose per shipment × total number of shipments per year). The cited general population exposures also include contributions from various stops along the route.

[d] Exposure to the general population includes exposure to those living along the transit route (off-link) and those that are in traffic (on-link). Calculation uses general public population density living within 0.5 miles (800 meters) of the route roadway as determined using DOE Transportation Routing Analysis Geographic Information System (Web-TRAGIS) and updated to estimate population densities for the calendar year 2050.

[e] Exposure to the truck crew. Calculation input assumes a two-person truck crew, with a crew distance from the cargo assumed to be centered on the trailer.

[f] Exposure to workers required for shipment handling at origin and destination (i.e., loading and unloading containers on truck). Calculation input assumes four workers are exposed for 1 hour at a distance of 3.28 feet (1 meter) per handling event.

Table 4-5: Radiological Doses Estimated for GMPEF Site Radioactive Material Incident-Free Truck Shipment Scenarios

Shipment Scenario [a]	Exposure per Truck Shipment [b] (person-Sv)				Annual Exposure [c] (person-Sv/year)			
	In-Transit General Population Exposure [d]	In-Transit Truck Crew Exposure [e]	Worker Handling Exposure [f]	Bystander Rest Stop Exposure [g]	In-Transit General Population Exposure	In-Transit Truck Crew Exposure	Worker Handling Exposure	Number of Shipments

[9] Exposure to bystanders around the truck at a crew rest or truck refueling stop along transit route. Calculation input assumes 25 bystanders at a distance of 33 feet (10 meters) from the truck during a 30-minute stop.
[h] Radioactive material transferred on site within property boundaries of Paducah Site and GMPEF Site or a very short distance on a private road between the two. Essentially, there will be no general public exposure along the planned route to be used to move the material between the GMPEF Site and the Paducah Site, as the transport would occur within the Paducah Site. The truck speed was assumed to be between 12.5 (10 percent of the distance) and 25 (90 percent of the distance) miles per hour. It is also assumed that the same size truck-trailer as that used for transporting natural UF_6 is used for transporting DUF_6 to and from Paducah Site.
[i] Return of empty cylinders (heels); there are two cylinders in tandem per shipment.
[j] LLRW dose exposure results is based on the assumption that the wastes would be packaged in 4x4x4-foot boxes with 36 boxes per shipment. It is also assumed that there would be 36 shipments of the LLRW per year consistent with the assumption in NUREG-1938 (NRC, 2012).

Table 4-6: Scenario Radioactive Packaging and Shipment Assumptions

Material Type Container	Shipping	Shipment External Dose at 1 meter [a]	Containers per Truck Shipment	Total Annual Truck Shipments [d]
UF_6 feed	48Y cylinder	0.30 mrem/hr	1 cylinder	70
UF_6 product	30B cylinder	1.0 mrem/hr	5 cylinders	34
DUF_6 tails	48Y cylinder	0.30 mrem/hr	1 cylinder	1,185
Empty 48Y cylinder [b]	48Y cylinder	2.0 mrem/hr	2 cylinders	35
LLRW	LLRW Type A [c]	0.15 mrem/hr	tractor-trailer load	36

Key: DU = depleted uranium; DUF_6 = depleted uranium hexafluoride; LEU = low-enriched uranium; LLRW = low-level radioactive waste; mrem/hr = millirems per hour; UF_6 = uranium hexafluoride
Notes:
[a] Shipment external doses obtained from Table D-6 in NRC (NRC, 2012).
[b] Empty cylinders contain small amounts of radioactive residual concentrates ("heels").
[c] The LLRWs are assumed to be shipped in 4x4x4-foot boxes with 36 boxes per shipment (Table D-2 in NRC (2012)).
[d] Annual number of shipments assumptions: (1) the product from DU enrichment (which is equivalent to the Natural UF_6 composition) would be used as the feed to the LEU enrichment facility; this would lead to NatUF_6 shipment needs of 70 (need 312 shipments and 292 shipments from the DUF_6 enrichment); and (2) the tails shipments of 1,185, which consists of 904 shipments from DUF_6 enrichment and 281 shipments from LEU enrichment.

Additionally, the radiological dose estimates show a range of dose equivalent exposures for bystanders (25 persons at a stop for a half hour) and handling workers (four persons for one hour). The bystanders' doses are a one-time event, whereas the workers are assumed to be exposed to all of the assumed shipments over a 1-year period. The bystanders' exposures show a range from 9.0×10^{-6} to 1.0×10^{-4} person-Sv (0.9 to 10 person-millirem(s) [mrem]). These doses are well below the regulatory radiological dose exposure limits for individual members of the public established by the NRC total effective dose equivalent (TEDE) limit of 100 mrem/year (10 CFR 20 *Standards for Protection Against Radiation*). The radiological dose estimates also present a range of 1.2×10^{-5} to 8.1×10^{-3} person-Sv/year (1.2 to 810 person-mrem/year) for the annual radiological dose estimates for the two transport truck crew; and a range of 1.0×10^{-3} to 4.0×10^{-2} person-Sv/year (100 to 4,000 person-mrem/year) for the four workers required for material handling at shipment points of origin and destination. These doses are well below the regulatory radiological dose exposure limits for individual workers established by the NRC TEDE limit of 5,000 mrem/year (10 CFR 20 *Standards for Protection Against Radiation*). Section 4.12.2, *Radiological Impacts*, discusses the nuclear safety program that would include the Proposed Action, in compliance with applicable State, NRC (10 CFR 20), and Occupational Safety and Health Administration (OSHA) (29 CFR 1910, *Occupational Safety and Health Standards*) requirements. Dose exposure to in-transit truck crews and workers handling shipments will be monitored and mitigated using time, distance and shielding to maintain worker dose As Low As Reasonably Achievable (ALARA).

For the natural UF_6 feed and UF_6 product (enriched uranium), actual shipments of the materials would likely involve receiving the UF_6 feed from, or shipping the UF_6 product to, a combination of the applicable facilities listed in Table 4-5. For example, GeM could ship the UF_6 product to several fuel fabrication facility customers off site, such as the existing facilities in Wilmington, North Carolina, Columbia, South Carolina, and Richland, Washington. Additionally, the NRC has or is expecting applications for several new tri-structural isotropic particle fuel or metal fuel manufacturers in the Oak Ridge, Tennessee, area. Consequently, the actual radiological exposure (doses) to the public and workers for radioactive shipments to a given facility would be lower than the maximum exposure values presented in Table 4-5 for the applicable shipment scenario and impacts on public and occupational health would be SMALL.

4.3.3.4 *Impacts of Operating Transportation on the Environment*

The NRC evaluated the impacts of nuclear materials transport on the environment in NUREG-0170, *Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes* (NRC, 1977), and more recently in NUREG/CR-4829, *Shipping Container Response to Severe Highway and Railway Accident Conditions* (NRC, 1987). Both studies included accident scenarios related to the transportation of radioactive material, and both studies found that these accidents carried no significant environmental impacts. More recent studies have been conducted and showed similar results with updated data (NRC, 2000b; NRC, 2014b).

Other impacts on the environment due to truck traffic associated with GMPEF operations are anticipated to be SMALL. Air emission estimates for the trucks used for transporting radioactive and other materials to and from the GMPEF Site are discussed in Section 4.7, *Air Quality Impacts*. These trucks would be traveling on paved, public roadways; therefore, the risk for grass, brush, or forest fires from the equipment sparking are no greater than the other heavy duty, 18-wheel diesel trucks that routinely travel on these roadways.

4.3.4 Cumulative Impacts

Construction, operation, and decommissioning of the GMPEF would result in a moderate increase in the daily vehicle trips on Hobbs Road, U.S. Hwy 60, and the connecting roadways in the vicinity of the facility.

However, impacts resulting from these traffic increases would not be cumulative (additive) since they would occur at different times.

The increased automobile and truck traffic associated with the GMPEF would increase motor vehicle air emissions and traffic noise in the vicinity of the GMPEF Site. Air emissions and noise impacts from the motor vehicle traffic accessing the GMPEF Site are discussed, respectively, in Section 4.7, *Air Quality Impacts* and Section 4.8, *Noise and Vibration Impacts*.

Approximately 1,300 workers are currently employed at the Paducah Site (PPPO TSS, 2024). As progress is made on cleanup activities, land, facilities, and infrastructure may become available to transfer for other uses. DOE began holding public workshops on future land use with Paducah stakeholders in 1994. Additional meetings were held with the PGDP Neighborhood Council, the Paducah Citizens Advisory Board, city and county officials, and economic development interests. In 2010, the Kentucky Research Consortium for Energy and Environment developed a community-based end-state vision encompassing the range of community perspectives for the site's future after the facility closes. A combination of industrial and recreational use is considered as the most likely future scenario for the site. However, no specific projects have been announced (DOE, 2024c).

The adjacent Global Laser Enrichment, LLC (GLE) Laser Enrichment Facility could have cumulative impacts with construction, operation, and decommissioning of the GMPEF. The GLE facility is expected to employ 600, 350, and 50 workers during construction, operations, and decommissioning, respectively. Truck traffic is expected to be an average of 35, 6, and 35 trips per day during construction, operations, and decommissioning, respectively (GLE, 2025).

According to McCracken County Planning and Zoning, there are no off-property projects currently being considered. However, Section 2.4, *Cumulative Effects*, did identify some nearby projects to consider. Phase 2 of residential development for the Arcadia Pines subdivision, located approximately 4 miles (6.4 kilometers) southeast of the Paducah Site on Red Pine Circle on approximately 35 acres, has received preliminary approval. Several infrastructure improvement projects are planned, including the Ohio River Shoreline, Paducah Kentucky Reconstruction Project located in McCracken County, Kentucky, on the left bank of the Ohio River, with activities occurring as close as 4 miles (6.4 kilometers) from the Paducah Site. Approximately 3.5 miles (5.6 kilometers) from the Paducah Site, the Kentucky Transportation Cabinet is developing engineering design plans for a proposed U.S. Hwy 60 improvement project between Ballard and McCracken Counties. Outside of the 5-mile (8-kilometer) radius of the Paducah Site, the Kentucky Transportation Cabinet is designing a project to widen Friendship Road in Paducah, Kentucky (approximately 7 miles [approximately 11 kilometers] east of the Paducah Site). McCracken County Sports Tourism Commission submitted a Permit for the Department of the Army proposed Stuart Nelson Park facility upgrade (USACE, 2024), which is located approximately 8 miles (12.9 kilometers) from the Paducah Site. The cumulative impacts of the facilities and actions described above combined with the Proposed Action are summarized in Table 2-3 and overall, these impacts are anticipated to be SMALL.

The impact of the cumulative daily vehicle trips that would be generated by the GMPEF, combined with vehicle traffic from the PGDP, and the new GLE Laser Enrichment Facility on traffic flow for the segment of Hobbs Road between Woodville Road and the intersection with U.S. Hwy 60 is anticipated to be MODERATE. On a regional basis, the cumulative transportation impacts are expected to be SMALL.

Radiological exposure (doses) to the public and workers from radioactive material shipments associated with the Proposed Action would result in SMALL impacts that would not substantially contribute to cumulative impacts of radioactive material transportation in the United States.

4.3.5 Mitigation Measures

Control measures that can be used to mitigate the motor vehicle traffic impacts on Hobbs Road and connecting roadways due to the construction, operation, and decommissioning of the GMPEF Site include the following:

- Construct roadway improvements on Hobbs Road to improve traffic flow and minimize congestion during peak traffic hours.
- Schedule GMPEF operations worker shift changes and truck shipments for off-peak traffic periods, when practical.

Transportation impact-control measures for construction, operation, and decommissioning of the GMPEF Site are discussed further in Section 5.2, *Transportation*.

4.4 Geology and Soils Impacts

This section summarizes the known and potential soil and geological impacts associated with the GMPEF. Section 4.4.1, *GMPEF Site Soils*, describes the shallow soils that would be impacted (e.g., soil erosion) during construction, operation, and D&D of the GMPEF and Section 4.4.2, *Geological Impacts*, summarizes the impacts on geological resources. The impacts of hazards produced by geologic and soil conditions are described and evaluated in the accident analysis documentation.

4.4.1 GMPEF Site Soils

This section describes potential impacts associated with the Proposed Action on the soils at the site. For purposes of this ER, soils are typically considered to include the upper 10 feet, including topsoil. Impacts associated with deeper unconsolidated deposits are described in Section 4.4.2, *Geological Impacts*.

4.4.1.1 *Proposed Action*

Details of the plant layout for the Proposed Action are described in Section 2.1.2.2, *Site and Facility Information*, and the GMPEF Site is depicted on Figure 1-3. A map of the GMPEF Site showing site soils is presented on Figure 3-7. Descriptions of the soils that would be affected by construction of the GMPEF are included in Section 3.3.3.1, *GMPEF Site Soils.*

Issues related to soil disturbances during construction, operation and D&D of the GMPEF include soil excavation, storage, and grading; erosion controls; and stormwater management. All components of the Proposed Action would be conducted in compliance with the existing GeM Kentucky Pollutant Discharge Elimination System (KPDES) Construction Stormwater Permit. Applicable regulations and permits, some of which affect soils impacts, are summarized in Section 1.5, *Applicable Regulatory Requirements, Permits, and Required Consultations*. Possible mitigation methods to avoid or minimize the impacts are described in Chapter 5.0, *Mitigation Measures*.

4.4.1.1.1 Construction

As described in Section 3.3.2.1, *Topography and Physiography*, the GMPEF Site is relatively flat. Under the Proposed Action, grading and terrain changes to the GMPEF Site would be small and result in SMALL impacts. Tree clearing activities and grading activities have taken place on approximately 70 acres of the approximately 107-acre site as reflected in the CX determination in *Site Preparation Including Tree Clearing (Parcel A) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (CX-270853) and *General Matter, Inc. Site Preparation (Parcel A) at the Paducah Gaseous Diffusion Plant, Kevil, McCracken, Kentucky* (451.1a-093), respectively. An additional 6.8 acres of presently undeveloped forest (in Parcel C) would require tree clearing and grading, which will be evaluated in a separate NEPA evaluation by the appropriate regulatory authority. The remaining 30 acres of the GMPEF Site were cleared and graded prior

to GeM's lease and are now periodically mowed vegetation areas under the transmission line ROW. Compliance with the existing GeM KPDES Construction Stormwater Permit would continue to minimize the potential for transport of eroded soils during construction.

General construction activities that would disturb shallow soils are anticipated to include stripping of topsoil and other soils not deemed suitable within much of the GMPEF Site; backfill, compaction, and grading activities for roads, parking areas, and buildings; and foundation installations for buildings. No deep excavation (greater than 10 feet) is anticipated. Geotechnical exploration conducted on the GMPEF Site revealed soil conditions that are not suitable for facility construction (BFW Engineering & Consulting, Inc., 2026a). As a result, an estimated 317,000 cubic yards of soil would be excavated from the 107-acre GMPEF Site. GeM may reuse some or all of the excavated soils onsite or may export soils for disposal at offsite location(s). These offsite haul locations include two nearby agricultural locations: 4235 Hobbs Road, Kevil, Kentucky, and 37°03'54.2"N 88°49'47.0"W. Any export and disposal of excavated soils would be conducted in accordance with applicable State laws. It is expected that approximately 376,000 cubic yards of soil would then be needed as backfill. Soils to be used for backfilling would be tested to ensure that they meet minimum appropriate engineering specifications. Backfill soils would be imported and sourced from nearby agricultural location(s), including 37°03'54.2"N 88°49'47.0"W.

The grading within the GMPEF Site would begin with the removal of topsoil and other unsuitable soils from areas designated for the new construction. Soils may be unsuitable for construction because they are too soft, too wet, and/or have other characteristics resulting in low strength or poor load-bearing capacity. The shallow soils are moisture-sensitive and would require greater depth of repair if earthwork is performed during the wetter months of the year (BFW Engineering & Consulting, Inc., 2026a). Following removal of topsoil and unsuitable soils, areas at grade or designated to receive fill would likely be proof rolled to identify those areas needing additional soil repair. If excessive ruts or pumps appear in the opinion of the geotechnical engineer, that area would be undercut to firm bearing or be repaired, as directed by the engineer. Fill material exceeding minimum engineering characteristics would be placed to achieve desired surface elevation.

Because soils would be stripped from much of the site, and because soil volumes may be imported to or exported from the site, impacts on soils resulting from construction activities are expected to be MODERATE.

4.4.1.1.2 Operation

Impacts on shallow soils after construction is complete and during GMPEF operation are not expected. Operation of the GMPEF would not involve additional soil disturbances; therefore, impacts would be SMALL.

4.4.1.1.3 Decontamination and Decommissioning

As described in Section 2.1.2.1.3, *Decontamination and Decommissioning*, D&D of the GMPEF would involve, with the exception of the switchyards, the removal of all structures, roads and utilities, grading of the GMPEF Site, and establishing vegetative cover. Soil testing would also be conducted to demonstrate that any residual soil impacts, as compared to the baseline soil-sampling results (see Chapter 5.0, *Mitigation Measures*), meet NRC and U.S. Environmental Protection Agency (EPA) guidelines. In areas where buildings and structures are removed and soils restored, the resulting impacts on soils would be beneficial. Therefore, overall impacts on soils from D&D are expected to be SMALL and largely beneficial.

4.4.1.2 *Cumulative Impacts on Soils*

As discussed in Section 2.4, *Cumulative Effects*, construction is planned for the GLE PLEF directly to the south of the GMPEF Site and the parcel of land that is being turned over for industrial development to the

east of the GMPEF Site. Construction would remove soils, compact soils, and cover soils with foundations and other hard surfaces. Erosion could be enhanced due to exposed soils during construction. During operation of the GMPEF, and in light of other planned actions in the vicinity, there would be a decrease in erosion due to covering soils and conversion of vegetated lands to impervious surfaces. D&D of the GMPEF and other planned actions in the region would likely have beneficial impacts on soils.

Considering the combined impacts of the three major projects in the area, MODERATE cumulative impacts on soils in the area could result because of removal and covering of soils, compaction, and erosion.

4.4.1.3 *Control of Impacts on Site Soils*

As previously stated, impacts on soils during operations and D&D are expected to be SMALL. The practices and measures used to further control the MODERATE construction impacts include:

- Engineering design plans that minimize soil disturbance during construction activities.
- Management of construction activities so that only limited areas within the GMPEF Site are disturbed at any time.
- Best management practices (BMPs) to control soil and sediment migration, as specified by the existing GeM KPDES Construction Stormwater Permit and Chapter 5.0, *Mitigation Measures*.
- Establishment and implementation of an approved Decommissioning Plan for ultimate NRC release of the site for unrestricted use and lease termination pursuant to 10 CFR 20.1401, which includes soil restoration to the extent reasonably feasible.

4.4.2 Geological Impacts

This section summarizes the impacts on geological resources including geologic strata; mineral, aggregate and fossil fuel resources; fault reactivation; and geologic hazards such as slope instability, and karst collapse. A description of the local and regional geologic framework is provided in Section 3.3.3, *Geology and Soils*, along with a discussion of the properties of unconsolidated deposits, geotechnical properties, and seismology. As described in Section 3.3.2.3, *Economic Geologic Resources*, there are no known substantial economic geologic resources (e.g., minerals, aggregate, fossil fuels) beneath the GMPEF Site. As described in Section 3.3.5.1, *Other Potential Geologic Hazards*, the site is relatively flat and is not in an area of slope instability or karst development.

4.4.2.1 *Proposed Action*

The plant layout for the Proposed Action is described in Section 2.1.2.2, *Site and Facility Information*.

4.4.2.1.1 Construction

Construction activities for the Proposed Action would involve removal of soils but no deep excavations (greater than 10 feet) are expected. Except for installation and development of groundwater monitoring wells, no injection of fluids into geologic strata is expected. Because no deep excavations would be made; no substantial injection of fluids into geologic strata would occur; the site is relatively flat and not prone to slope instability; the site is not in an area of karst development; and there are no known substantial economic geologic resources (e.g., minerals, aggregate, fossil fuels) beneath the GMPEF Site; impacts on geologic resources would be SMALL.

4.4.2.1.2 Operations

Operations activities for the GMPEF would involve no disturbance of geologic media, and no injection of fluids into geologic strata. Because operations activities for the project would involve no disturbance of geologic media; no injection of fluids into geologic strata; the site is relatively flat and not prone to slope

instability; the site is not in an area of karst development; and there are no known substantial economic geologic resources (e.g., minerals, aggregate, fossil fuels) beneath the GMPEF Site; impacts on geologic resources would be SMALL.

4.4.2.1.3 Decontamination and Decommissioning

As described in Section 2.1.2.2, *Site and Facility Information*, D&D of the GMPEF would involve removal of the building structures and associated foundations. Soil testing may also be part of the process, as appropriate, to demonstrate that any residual subsurface soil impacts meet NRC and EPA guidelines. D&D activities would be similar to construction activities and therefore would have overall SMALL impacts on geology.

4.4.2.2 *Cumulative Impacts on Geology*

As described in Section 2.4, *Cumulative Effects*, the DOE Paducah Site lies to the north of the GMPEF Site and there are several offsite projects scheduled to occur within the vicinity of the GMPEF. This includes the new PLEF (GLE, 2025) proposed to be constructed adjacent to the GMPEF, and the turnover of areas to the east of the GMPEF Site for industrial development (DOE, 2025d). Because none of these other projects are likely to involve substantial disturbance of deep geologic media; substantial injection of fluids into geologic strata; the sites are not in an area of karst development; and there are no known substantial economic geologic resources (e.g., minerals, aggregate, fossil fuels) beneath the sites; cumulative impacts on geologic resources are expected to be SMALL.

4.4.2.3 *Control of Impacts from Site Geology*

As previously indicated, potential geological impacts from the GMPEF are expected to be SMALL. Therefore, mitigation of geologic impacts would not be needed. The impacts of geologic conditions on site construction and operation would be accounted for in the specifications for facility design. For example, foundations would be designed to meet building codes and to control impacts from seismic events and predicted settlement from projected building loads. These potential mitigation methods are also described in Chapter 5.0, *Mitigation Measures*. Geologic conditions would be considered along with other hazards in the facility safety analyses.

4.5 Water Resource Impacts

This section provides a description of the potential water resource impacts associated with the Proposed Action, including potential impacts on groundwater quality (Section 4.5.1), surface water (Section 4.5.2), floodplains (Section 4.5.3), and water use (Section 4.5.4). Groundwater would not be withdrawn or injected by the GMPEF; therefore, there would be no impacts on groundwater quantity, and that topic is not discussed further.

4.5.1 Groundwater Quality Impacts

This section focuses on groundwater quality impacts. Potential groundwater supply impacts are discussed in Section 4.5.4, *Water Use*.

4.5.1.1 *Proposed Action*

The GMPEF would not discharge untreated effluents or other materials in quantities that are anticipated to impact groundwater quality. Section 2.1.2, *Proposed Action*, Section 4.13, *Waste Management Impacts*, and Chapter 5.0, *Mitigation Measures*, describe aspects of the GMPEF design and hazardous material and waste-handling practices that would be implemented as part of the Proposed Action to limit the potential for accidental release of hazardous constituents and impacts on groundwater quality.

4.5.1.1.1 Construction

There would be no intentional direct releases of effluents to the groundwater during construction. Due to increased traffic and equipment used during construction of the GMPEF, incidental release of substances such as vehicle oil and grease would be possible. The potential release of these contaminants would be minimized by implementing BMPs and other procedures that prevent and contain releases and potential leaching to the groundwater (see Chapter 5.0, *Mitigation Measures*).

The water needed for GMPEF construction would be provided from the DOE Paducah Site or via tanker truck from offsite water sources that would be of potable quality. Sanitary waste would be managed using portable toilets. The potential release of contaminants from construction-related wastewaters (such as dust suppression, foundation dewatering, and concrete washout) would be minimized by implementing BMPs and other procedures that contain and prevent releases and potential leaching to groundwater (see Chapter 5.0). Therefore, anticipated impacts on groundwater quality during construction would be SMALL.

4.5.1.1.2 Operation

There would be no intentional direct releases of effluents to the groundwater during operations. No more than trace levels of radiological constituents, if any, are anticipated to be released from the GMPEF to the stormwater considering the procedures that would be in place for managing and monitoring stormwater from the UF_6 cylinder storage pads and other areas of the site (see Section 4.5.2.1.2.2, *Operation*, and Section 4.13.1.2.1, *Wastewaters*). The anticipated impacts on surface water quality from stormwater runoff from buildings, parking lots, roadways, UF_6 cylinder storage areas, and maintained landscaped areas during operation of the GMPEF are expected to be SMALL (see Section 4.5.2, *Surface Water Impacts*). A small fraction of stormwater effluent might infiltrate to the shallow groundwater; therefore, the potential for impacts on groundwater quality is expected to be SMALL.

4.5.1.1.3 Decontamination and Decommissioning

As described in Section 2.1.2.1.3, *Decontamination and Decommissioning*, D&D of the GMPEF would involve the removal of all structures, roads and utilities, grading of the GMPEF Site, and establishing vegetative cover. The Decommissioning Plan to be prepared at the end of the GMPEF's life would include decontamination, dismantlement, and clean-up procedures; methodology and general decontamination and cleaning methods; and waste management protocol. These procedures, methods, and protocols would be designed to clean up the site and prevent impacts including those on groundwater quality. The decommissioning process would also require sampling to verify any residual impacts when compared to baseline sampling results (see Chapter 5.0, *Mitigation Measures*) to meet NRC and EPA guidelines. Therefore, there are no anticipated adverse impacts on groundwater quality due to decommissioning. In fact, D&D is likely to have beneficial effects.

4.5.1.2 *Cumulative Impacts*

Groundwater quality impacts are anticipated to be SMALL individually for the construction, operation, and D&D of the Proposed Action. Therefore, it is anticipated that the GMPEF would not substantially contribute to cumulative groundwater impacts.

As described in Section 2.4, *Cumulative Effects*, the DOE Paducah Site lies to the north of the GMPEF Site and there are several offsite projects scheduled to occur within the vicinity of the GMPEF. This includes the new PLEF (GLE, 2025) proposed to be constructed adjacent to the GMPEF, and the turnover of areas to the east of the GMPEF Site for industrial development (DOE, 2025a). As described in Section 3.4.1.3, *Preexisting Groundwater Impacts*, operation of the DOE Paducah Site has resulted in groundwater contamination. This contamination is to the north of the GMPEF Site and moving north away from the

Site. Because groundwater contamination is not expected as a result of operation of the GMPEF, cumulative impacts with the existing contamination to the north of the GMPEF Site are not expected.

GLE plans to construct and operate a laser enrichment facility to the south of the GMPEF Site. As described in Section 3.4.1.2, *GMPEF Site Aquifers and Confining Units*, groundwater beneath the PLEF Site flows toward the GMPEF Site. Groundwater contamination originating at the PLEF could impact groundwater beneath the GMPEF Site. As described in the PLEF ER (GLE, 2025), groundwater quality impacts from construction, operations, and decommissioning of the PLEF are not expected. Therefore, cumulative impacts on groundwater quality would be expected to be SMALL.

4.5.1.3 *Control of Impacts*

Control and prevention of impacts on groundwater quality would be provided through several mechanisms. Section 2.1.2, *Proposed Action*, Section 4.13, *Waste Management Impacts*, and Chapter 5.0, *Mitigation Measures* describe aspects of the GMPEF design and hazardous material and waste-handling practices that would be implemented as part of the Proposed Action. These practices would limit the potential for accidental release of hazardous constituents and the impact on groundwater quality. In addition, the existing DOE and Kentucky groundwater monitoring programs near the GMPEF Site would be supplemented by installation of additional monitoring wells at the GMPEF, which would be sampled as part of the GMPEF Monitoring Program (see Chapter 6.0, *Environmental Measurements and Monitoring Programs*).

4.5.2 Surface Water Impacts

This section focuses on surface water impacts. Potential water supply impacts are discussed in Section 4.5.4, *Water Use*.

4.5.2.1 *Proposed Action*

The GMPEF Site is subject to Federal Phase II Stormwater Management requirements (40 CFR Part 122, *EPA Administered Permit Programs: The National Pollutant Discharge Elimination System [NPDES]*). Permitting authority under the NPDES program was delegated by EPA to the State of Kentucky in 1983; therefore, the KPDES program establishes pollutant criteria limits for permitted wastewater discharges.

Additional information on surface waters located within the GMPEF Site are described in Section 3.4.2.1, *Streams, Lakes and Impoundments*. Figure 3-19 depicts the location of the GMPEF and the surface waters of the GMPEF Site. Methods and practices to avoid, minimize, and mitigate impacts on surfaces water are discussed in Section 4.5.2.3, *Control of Impacts on Surface Waters*, and Section 5.4.2, *Surface Waters*.

4.5.2.1.1 Impacts on Surface Water Quality

4.5.2.1.1.1 Construction

As detailed in Section 3.4.2.1.1, *Streams*, and as shown on Figure 3-19, current drainage from the GMPEF Site flows east to Little Bayou Creek and its unnamed tributaries and west to Bayou Creek. Stormwater runoff from the GMPEF would be routed to several stormwater ditches that would be created as a part of the Proposed Action. Due to vegetation removal, grading, and other land-disturbing activities, increased sediment loadings to receiving streams could occur during construction. Final site drainage plans would be established as design work progresses.

A KPDES stormwater construction general permit would be required and a Storm Water Pollution Prevention Plan (SWPPP) would be produced. Construction activities would comply with permit requirements and would be designed in accordance with BMPs. During construction, sediment would be the primary potential water pollutant due to recent vegetation removal and rough grading activities.

Sediment can be monitored as Total Suspended Solids (TSSs), settleable solids, and turbidity. Kentucky's water quality standards do not have a numeric value for TSSs but require that discharges do not change the TSSs of the receiving streams "to the extent that the indigenous aquatic community is adversely affected." Similarly, discharges of settleable solids may not "alter the stream bottom so as to adversely affect productive aquatic communities" (GLE, (2025); 401 Kentucky Administrative Regulation [KAR] 10:031, Section 4).

Increased traffic and equipment use during construction would increase the potential for accidental incidental release of oil, grease, or other contaminants from the construction vehicles. Releases would be avoided or minimized by regular maintenance and inspection of equipment and rapid response to clean-up spills that would contain and prevent contaminants from reaching surface water.

Impacts would be minimized with the implementation of surface water runoff and erosion control measures required by the KPDES stormwater construction general permit and SWPPP. Implementation of mitigation practices discussed in Section 4.5.2.3, *Control of Impacts on Surface Waters* and Section 5.4.2, *Surface Waters*, indicate that impacts on surface water quality are anticipated to be MODERATE during GMPEF construction.

4.5.2.1.1.2 Operation

As discussed in Section 4.13.1.2.1, *Wastewaters*, up to 10,000 gallons per day (gpd) of sanitary wastewater would be conveyed to the DOE sanitary sewer, and after treatment at the C-615 Sewage Treatment Plant (STP), ultimately discharged at KPDES permitted Outfall 004, which then discharges through Outfall 008 to Big Bayou Creek. This would be approximately a 9 percent increase of the average 115,000 gpd currently discharged by the DOE STP to Big Bayou Creek. The C-615 STP has a design capacity of 500,000 gpd, providing adequate capacity for the additional discharge. Discharges would be in compliance with the existing DOE STP permit and are not expected to differ in water quality from the existing DOE STP discharges.

Stormwater runoff from the GMPEF would consist of runoff from buildings, parking lots, and cylinder storage yards, and is expected to be similar to the quality of runoff from typical commercial sites. The only significant difference would be the potential for release of UF_6.

UF_6 cylinders would be cleaned of any surface contamination before being placed in the storage yard. In addition, cylinders would be routinely monitored to ensure their integrity. Local surface waters would also be routinely monitored as described in Chapter 6.0, *Environmental Measurements and Monitoring Programs*. Given these BMPs, no more than trace levels of radiological contamination, if any, are anticipated to be released to surface waters from the GMPEF Site.

As noted in Section 3.4.2.2, *Surface Water Quality Characteristics*, the Kentucky Division of Water has designated Little Bayou Creek as not supporting warm water aquatic habitat due to copper, lead, polychlorinated biphenyls (PCBs), and unknown causes contamination (GLE, 2025; KDOW, 2022a). A total maximum daily load, which led to the implementation of a fish consumption advisory, identified the DOE Paducah Site as the source of PCBs downstream of the GMPEF Site. The DOE Paducah Site is authorized to discharge into Little Bayou Creek through KPDES Permit KY0004049 (GLE, 2025; KDEP, 2022a). The GMPEF is not expected to use or store PCBs or lead on site, therefore no PCBs or lead would be expected in its discharges. Copper is often used as a biocide in many typical industrial settings. Using copper-free biocide products can reduce or eliminate the potential from copper in discharges from the GMPEF. Additionally, there may be copper pipes that might erode some trace amounts of copper into sanitary wastewater. The amount of copper discharged from this source is expected to be very small.

During operations, sediment loads and runoff characteristics would be expected to be similar to other industrial areas at the DOE Paducah Site. Small amounts of oil and grease, metals, and other constituents associated with vehicular activity would be expected to be carried in runoff from the access roads and parking lots; however, BMPs, such as the use of ditches, grass swales, and stormwater infiltration areas, would help trap sediments and any contaminants.

Vegetation maintenance practices would be similar to existing industry standard practices. Chemical herbicides and pesticides would only be used in site-specific locations and would only be applied by licensed herbicide and pesticide applicators under applicable regulations (302 KAR 26), decreasing the potential for the entry of herbicides and pesticides into surface waters. In addition, the implementation of BMPs and other practices to contain and prevent the release of herbicides and pesticides would minimize impacts (see Chapter 5.0, *Mitigation Measures*).

The Proposed Action would be designed and operated to comply with water quality standards and permit requirements. These factors, combined with implementation of mitigation practices discussed in Section 4.5.2.3, *Control of Impacts on Surface Waters*, and Section 5.4.2, *Surface Waters*, indicate that impacts on water quality would be SMALL during the operation of the GMPEF.

4.5.2.1.1.3 Decontamination and Decommissioning

As described in Section 2.1.2.1.3, *Decontamination and Decommissioning*, D&D of the GMPEF would involve the removal of all structures, roads and utilities, grading of the GMPEF Site, and establishing vegetative cover. Stormwater management and erosion-control BMPs similar to those required during construction would be used to mitigate potential impacts during D&D and disturbed areas would be replanted in accordance with the regulations in affect at the time of D&D (see Chapter 5.0, *Mitigation Measures*). Planning for D&D would involve sampling environmental media to ensure that any contamination is contained, remediated and not released to the environment during D&D. The overall impact to surface water quality from D&D would be similar to but less than construction impacts and would be temporary and SMALL. In fact, D&D is likely to have overall long-term beneficial impacts.

4.5.2.1.2 Impacts on Surface Waters (Physical)

4.5.2.1.2.1 Construction

There are no proposed physical impacts on surface waters from construction; the anticipated direct impacts on existing surface waters are SMALL. Mitigation measures to reduce the impact on surface water physical characteristics are discussed in Chapter 5.0, *Mitigation Measures*.

4.5.2.1.2.2 Operation

There would be no land disturbance and physical impacts on any surface water bodies during operations. Therefore, physical impacts on surface water during operations would be SMALL.

4.5.2.1.2.3 Decontamination and Decommissioning

As described in Section 2.1.2.1.3, *Decontamination and Decommissioning*, decontamination and decommissioning of the GMPEF would involve the removal of all structures, roads and utilities, grading of the GMPEF Site, and establishing vegetative cover. There would be no onsite surface water bodies and offsite surface water bodies would not be physically affected during D&D. Therefore, physical impacts on surface waters from D&D are expected to be SMALL.

4.5.2.1.3 Impacts on Surface Water Flow

4.5.2.1.3.1 Construction

The loss of approximately 70-acres of vegetation due to the recent rough grading (CX-270853) is likely to accelerate surface runoff, decrease soil water absorption, and increase soil erosion. As such, stormwater runoff from the GMPEF would need to be routed to several stormwater ditches. To minimize these impacts, BMPs incorporated into the SWPPP would be used to manage stormwater runoff to offsite areas such as Bayou Creek and Little Bayou Creek.

Water used during construction would be obtained from the DOE Paducah Site or offsite sources and would not impact surface water quantities of Bayou Creek or Little Bayou Creek. Therefore, impacts from construction of the GMPEF to surface water flow is expected to be SMALL. Mitigation measures to reduce the impact on surface water flow are discussed in Chapter 5.0, *Mitigation Measures*. See Section 4.5.4, *Water Use*, for a discussion of the impacts of GMPEF water use.

4.5.2.1.3.2 Operation

Stormwater runoff would likely increase due to the conversion of the GMPEF Site from forested land to an industrial area. GeM will obtain KPDES permit coverage for two additional outfalls to Bayou Creek and Little Bayou Creek (see Figure A-6). Stormwater runoff would then be conveyed to the new permitted outfalls. New outfalls will be constructed during the construction phase of the Proposed Action activities. GeM plans to submit permit applications for the new outfalls to the Kentucky Department of Environmental Protection by the end of 2026. No process or cooling water will be discharged to the DOE C-615 treatment plant system. Cooling water will be treated and then discharged to Bayou or Little Bayou.

As discussed in Section 3.4.5, *Water Use*, during operations, the GMPEF would obtain operational water from the DOE Paducah Site with the potential for obtaining water from the Paducah Water Works in the future. No surface water withdrawals from onsite waterbodies would occur during operations.

As discussed in Section 4.13.1.2.1, *Wastewaters*, up to 10,000 gpd of sanitary wastewater would be conveyed to the DOE sanitary sewer and after treatment at the C-615 STP, discharged through DOE KPDES permitted Outfall 004, which then discharges through Outfall 008. Outfall 008 discharges into Big Bayou Creek. This would be approximately a 7 percent increase of the average 115,000 gpd currently discharged by the DOE STP to Big Bayou Creek. Therefore, the impacts to surface water flows in nearby surface water bodies are expected to be SMALL. See Section 4.5.4, *Water Use*, for a discussion of the impacts of GMPEF water use.

4.5.2.1.3.3 Decontamination and Decommissioning

As described in Section 2.1.2.1.3, *Decontamination and Decommissioning*, D&D of the GMPEF would involve the removal of all structures, roads and utilities, grading of the GMPEF Site, and establishing vegetative cover. Disturbed areas would be re-planted in accordance with the regulations in effect at the time of decommissioning. The impacts from D&D are expected to be similar to but less than those from construction. The Decommissioning Plan would include BMPs for surface water runoff. Therefore, impacts on surface water flow from D&D of the GMPEF are expected to be temporary and SMALL.

4.5.2.2 *Cumulative Impacts on Surface Waters*

As described in Section 2.4, *Cumulative Effects*, the DOE Paducah Site lies to the north of the GMPEF Site and there are several offsite projects scheduled to occur within the vicinity of the GMPEF. This includes the new PLEF (GLE, 2025) proposed to be constructed adjacent to the GMPEF, and the turnover of areas to the east of the GMPEF Site for industrial development (DOE, 2025a). With the exception of the DOE

Paducah Site and the PLEF, most other offsite projects are in different watersheds and would not have cumulative impacts on Bayou Creek and Little Bayou Creek.

As described above, impacts from the Proposed Action to Little Bayou Creek and Bayou Creek are expected to be SMALL. In addition, surface water would not be used as a source of water supply and effluent discharges from activities related to the Proposed Action would be a small portion of the existing effluent discharges from the DOE Paducah Site and those proposed for the PLEF. It is not known what type of industry may be developed at the parcel recently turned over by DOE for industrial development. Therefore, the potential surface water impacts of activities at this parcel are unknown and were not considered here.

Therefore, although cumulative surface water impacts to Little Bayou Creek and Bayou Creek may be MODERATE, the contribution to these impacts from the GMPEF would be SMALL. Likewise, any contribution by the GMPEF to cumulative impacts on the Ohio River, would be SMALL.

4.5.2.3 *Control of Impacts on Surface Waters*

During construction, stormwater would be managed in compliance with the KPDES construction general permit and SWPPP. Surface water effluents during operations would be in compliance with the applicable DOE KPDES permit. The Proposed Action would utilize stormwater management structures, equipment, and methods as described in the Kentucky Energy and Environment Cabinet *Best Management Practices (BMPs) for Controlling Erosion, Sediment, and Pollutant Runoff from Construction Sites* (GLE, 2025; KEEC, 2009). BMPs would be designed and constructed in accordance with the procedures and guidelines listed within the manual to effectively manage stormwater runoff and reduce the resulting TSSs loading. Stormwater, sediment, and erosion control structures, equipment, and methods would meet applicable design guidelines listed in the Kentucky Energy and Environment Cabinet manual. Potential impacts from construction and operation would be controlled with measures and practices discussed in Chapter 5.0, *Mitigation Measures*.

4.5.3 Impacts on Floodplains

This section describes potential impacts associated with the Proposed Action on the floodplains near the GMPEF Site. The GMPEF Site is not located within a flood hazard area, as shown on Figure 3-22. The nearest flood hazard area to the proposed GMPEF Site is the Zone A flood hazard area for Bayou Creek, which is about 0.25 miles from the western boundary of the GMPEF Site. Further discussion of the existing floodplains is provided in Section 3.4.3, *Floodplains*.

4.5.3.1 *Proposed Action*

Rough grading activities have taken place on 100 acres of the GMPEF Site. Grading the remaining 6.8 acres of presently undeveloped forested land within the GMPEF Site would not impact floodplain boundaries, as the footprint of the GMPEF Site is not located within a flood hazard area. No direct modifications to the boundaries of the floodplains are expected under the Proposed Action as all construction, operation, and expected D&D activities would occur outside floodplain boundaries. The behavior of floodwaters due to any GMPEF Site changes are evaluated herein.

4.5.3.1.1 <u>Construction</u>

The behavior of floodwaters in the receiving water bodies may be altered due to GMPEF construction activities. Under the Proposed Action, an additional 6.8 acres of mixed forest will be graded and leveled. GMPEF construction will result in an increase in impervious structures and surfaces.

As described in Section 3.4, *Water Resources*, the approximately 107-acre GMPEF Site currently drains to Bayou Creek or Little Bayou Creek, as dictated by topography. If we conservatively assume that the entire

area of the GMPEF Site drains to Bayou Creek, that would be 107 acres compared to the total drainage area of 3,853 acres near the point runoff would reach Bayou Creek (GLE, 2025; USGS, 2024c) and 11,456 acres for the entire Bayou Creek prior to convergence with Little Bayou Creek (GLE, 2025; USGS, 2024d). Therefore, runoff from the GMPEF Site would be a small portion of the total flow that may contribute to the downstream floodplain. As such, the impacts from the increase in flow to Bayou Creek are expected to be SMALL.

Again, if we conservatively assume that the entire area of the GMPEF Site drains to Little Bayou Creek, that would be 107 acres compared to the total drainage area of 416 acres at the point near where runoff is expected to reach Little Bayou Creek (GLE, 2025; USGS, 2024e), making it a significant portion of the total flow at this point. Because portions of the GMPEF Site currently drain to Little Bayou Creek and measures would be instituted to control stormwater runoff such that runoff does not vary significantly from current discharges, the impact from runoff to the flow of Little Bayou Creek is expected to be SMALL. In addition, the entire drainage area for Little Bayou Creek prior to convergence with Bayou Creek is 6,035 acres (GLE, 2025; USGS, 2024f), therefore the runoff contribution from the GMPEF Site to the entire Little Bayou Creek floodplain is expected to be SMALL.

The impacts of increased floodwater drainage due to conversion of land use and construction activity would be fully determined once the GMPEF design is finalized. However, as the GMPEF Site is not located within a flood hazard zone, and the contribution of the GMPEF Site to each drainage basin is small, the overall impacts on the adjacent floodplains in Bayou Creek and Little Bayou Creek are expected to be SMALL.

4.5.3.1.2 Operation

Upon completion of construction, the GMPEF Site would have an altered land use and a different drainage pattern. GeM will obtain KPDES permit coverage for two additional outfalls to Bayou Creek and Little Bayou Creek (see Figure A-6). Stormwater runoff would then be conveyed to the new permitted outfalls. New outfalls will be constructed during the construction phase of the Proposed Action activities. GeM plans to submit permit applications for the new outfalls to the Kentucky Department of Environmental Protection by the end of 2026. Buildings, parking lots, stormwater retention basins, UF_6 cylinder storage pads, and maintained landscape areas would be constructed on most of the 107 acres of the GMPEF Site. Similar to the flows discussed in Section 4.5.3.1.1, *GMPEF Construction*, the built-upon area for the GMPEF Site are small relative to the total watershed drainage areas for Bayou Creek and Little Bayou Creek. Therefore, impacts from the increase in flow to floodplains is expected to be SMALL.

As the design of the GMPEF continues, additional hydraulic modeling for stormwater runoff may be performed and the impacts updated. Once the GMPEF design is finalized, changes in runoff, and hence floodwaters, can be fully ascertained, and impacts from a peak storm event will be determined. While changes to runoff are expected from conversion of the GMPEF Site from undeveloped, forested and vegetated land to impervious structures, there is no anticipated impact to floodplains due to runoff from the GMPEF, as it is not located within a flood hazard zone and the total runoff is much smaller compared to runoff from each watershed. Any increase in stormwater runoff from operation of the GMPEF buildings, parking lots, and storage facilities is expected to be mitigated by mitigation measures (see Chapter 5.0, *Mitigation Measures*, for additional details). Therefore, the impacts on floodplains due to operation of the GMPEF are expected to be SMALL.

4.5.3.1.3 Decontamination and Decommissioning

Anticipated impacts on floodplains or floodwaters at the GMPEF Site due to D&D activities are expected to be similar to the impacts of construction. Therefore, impacts would be SMALL.

4.5.3.2 *Cumulative Impacts on Floodplains*

As described in Section 2.4, *Cumulative Effects*, the DOE Paducah Site lies to the north of the GMPEF Site and there are several offsite projects scheduled to occur within the vicinity of the GMPEF. This includes the new PLEF (GLE, 2025) proposed to be constructed adjacent to the GMPEF, and the turnover of areas to the east of the GMPEF Site for industrial development (DOE, 2025a). As described in the PLEF ER (GLE, 2025), there are several offsite projects scheduled to occur within the vicinity of the GMPEF (see Section 2.4, *Cumulative Effects*). With the exception of the DOE Paducah Site, the PLEF, and the area to the east of the GMPEF Site that DOE is turning over for industrial development, most of the other projects are in different watersheds, and would not have cumulative impacts on the floodplains of Bayou Creek and Little Bayou Creek.

As described above, impacts from the Proposed Action to the floodplains of Little Bayou Creek and Bayou Creek are expected to be SMALL. Based on surface area, stormwater runoff from the 107-acre GMPEF Site would be a small portion of runoff from the 615-acre industrial portion of the DOE Paducah Site to the north and the proposed 322-acre industrial portion of the PLEF to the south (GLE, 2025). Impacts from the DOE Paducah Site should already be included in the calculated floodplain (Figure 3-22) and therefore would not contribute to additional floodplain impacts. Impacts on the floodplain from the PLEF are described in the PLEF ER (GLE, 2025) and are estimated to be SMALL.

It is not known what type of industry may be developed at the parcel recently turned over by DOE for industrial development. Therefore, the potential impacts on floodplains of activities at this parcel are unknown and were not considered here.

Therefore, cumulative impacts on floodplains are estimated to be SMALL, and the GMPEF would not be expected to substantially contribute to these impacts. Because of the very large flow of the Ohio River, cumulative impacts on the floodplain of the Ohio River from activities in the area around and including the GMPEF would be SMALL.

4.5.3.3 *Control of Impacts on Floodplains*

There are no anticipated topographic changes that would modify the floodplains, and the change in stormwaters due to GMPEF Site construction, operation, and D&D is expected to be SMALL. Therefore, there is no need to institute structural (e.g., levees, dams) or non-structural (e.g., land use management, policies, practices) flood protection measures. Additional surface water mitigation measures that would be implemented with the Proposed Action are discussed in Chapter 5.0, *Mitigation Measures*.

4.5.4 Water Use

This section discusses potential water use impacts associated with the Proposed Action, and cumulative impacts on the region around the GMPEF Site.

4.5.4.1 *Proposed Action*

The Proposed Action would not require surface water or groundwater withdrawals from within the GMPEF Site for construction, operation, or D&D. The GMPEF would obtain all water from the DOE Paducah Site water supply system. In the future, water may be obtained from the Paducah Water Works. See Section 3.4.5.1, *Regional Water Use*, for further discussion of Paducah Water Works.

4.5.4.1.1 Construction

Activities requiring water during construction of the GMPEF may include worker needs, dust suppression, concrete mixing, and equipment cleaning. The water needed during construction would be obtained from offsite potable water sources such as the DOE Paducah Site or Paducah Water Works and would be

provided by tanker truck. Approximately 24 million gallons per year (gpy) (75 acre feet per year) of water would be used during construction. For comparison, the DOE Paducah Site is permitted to withdraw up to 30 million gpd from the Ohio River (GLE, 2025; DOE, 2025e). Therefore, anticipated impacts on water use due to construction activities would be SMALL.

4.5.4.1.2 Operation

The GMPEF would obtain all water from the DOE C-611 Water Treatment Plant. In the future, water may be obtained from the Paducah Water Works (see Section 3.4.5.1, *Regional Water Use*). The estimated water use during operations would be 1.3 million gpd (1,456 acre-feet per year). For comparison, the DOE Paducah Site is permitted to withdraw up to 30 million gpd from the Ohio River (GLE, 2025; DOE, 2025e). Therefore, the impact on water use due to operations is expected to be SMALL.

4.5.4.1.3 Decontamination and Decommissioning

As described in Section 2.1.2.1.3, *Decontamination and Decommissioning*, D&D of the GMPEF would involve the removal of all structures, roads and utilities, grading of the GMPEF Site, and establishing vegetative cover. Activities during GMPEF D&D are expected to require similar or smaller quantities of water than the amounts needed during operations. Therefore, water use impacts during D&D are likewise expected to be SMALL.

4.5.4.2 *Cumulative Impacts*

As described above, no water would be withdrawn from either surface or groundwater for construction, operation, or D&D of the Proposed Action. Water is replenished over time, so the impacts of construction, operations, and D&D are not considered to be cumulative.

As described above, the impacts on water use of the Proposed Action are expected to be SMALL and a small percentage of the 30 million gpd of water the Paducah Site is permitted to withdraw from the Ohio River (GLE, 2025; DOE, 2025e). Therefore, water use related to the Proposed Action would not substantially contribute to cumulative water use impacts.

If in the future the GMPEF switches to water supplied by the Paducah Water Works the approximately 24 million gpy of water used during construction, and the estimated 8.8 million gpy used during operations, would be 1.5 and 0.5 percent of the 1.56 billion gpy (4.29 million gpd) of water supplied by the Paducah Water Works to its users. Likewise, the 112,100 gpd used by the PLEF operations (GLE, 2025) would be 2.6 percent of the 4.29 million gpd of water supplied by the Paducah Water Works. Therefore, water used for the GMPEF would not substantially contribute to cumulative water use impacts. It is not known what type of industry may be developed at the parcel recently turned over by DOE for industrial development. Therefore, the potential impacts on water use from activities at this parcel are unknown and were not considered here.

4.5.4.3 *Control of Impacts*

The GMPEF would not utilize surface water or groundwater from the GMPEF Site during construction, operation, or D&D and quantities to be used are estimated to be small percentages of the permitted withdrawal capacity of the DOE Paducah water supply system or the quantities currently supplied to users by the Paducah Water Works. Therefore, controls to mitigate impacts on water use are not needed. Still, BMPs could be adopted to conserve water use as described in Chapter 5.0, *Mitigation Measures*.

4.6 Ecological Resources Impacts

Rough grading activities have taken place on approximately 100 acres of the approximately 107-acre site. Of the approximately 100 acres, 70 acres previously contained mixed-growth forests, emergent and

forested wetlands, ephemeral streams and were the subject of a CX determination for land clearing (*General Matter, Inc. Site Preparation [Parcel A] at the Paducah Gaseous Diffusion Plant, Kevil, McCracken, Kentucky* [451.1a-093]). Under the Proposed Action, approximately 6.8 acres of forested habitat would be converted from undeveloped to developed land.

Potential impacts on ecological resources could include temporary and permanent disturbance, degradation, or loss of habitat from land-clearing activities or disturbance or displacement of wildlife due to an increase in noise and human activity. Impacts could also include fragmentation of remaining habitats resulting from project developments, increases in human-wildlife interactions (such as encounters and collisions between wildlife and motor vehicles), and potential radiological exposure.

4.6.1 Construction

4.6.1.1 *Impacts on Vegetation and Wildlife*

Implementation of the Proposed Action could result in direct and indirect impacts to vegetation and wildlife. Direct impacts could include habitat loss from the permanent conversion of approximately 6.8 acres of forested land to developed industrial land. Vegetation subject to clearing could support foraging, nesting, and other behaviors for mammals, birds (including migratory birds and Birds of Conservation Concern), and reptiles. Wildlife utilizing the area would be permanently displaced by the development. Mobile species (such as deer, rabbits, turkey, foxes, raccoons, and coyotes) would likely flush from the site to similar habitat(s) available nearby, including the adjacent locations previously utilized by the WKWMA. Less mobile species, such as invertebrates and small reptiles, would not be able to move to similar habitat and would be directly impacted by construction activities. To help prevent incidental wildlife mortality during construction activities, trenches (if used during construction) left open overnight would be inspected for animals that should be removed prior to backfilling. Escape ramps would also be placed at less than 45-degree angles in trenches to provide exit strategies for animals. Construction activities could also result in potential collisions between wildlife and motor vehicles. Mortality to wildlife caused by a collision could be minimized by reducing speeds to less than 15 miles per hour and increasing awareness of construction crews to the presence of any animals that may frequent the area. If an animal is observed in the road, vehicles will stop and wait until the animal leaves the road, and if necessary, encourage the animal to move on by driving forward slowly.

Direct impacts such as the interruption of breeding patterns and behavioral modification could also occur from construction-related noise, as wildlife in the vicinity could be temporarily disturbed by the change to the ambient environment and additional human activity. However, noise resulting from the proposed construction activities would be localized, short term, and only occur during daylight hours.

Indirect impacts to wildlife from habitat fragmentation could also occur. Land clearing would cause disturbances in the landscape resulting in new habitat edges, potentially disrupting wildlife ecosystem processes and habitats. The degree of the loss would depend on the behavior response of the individual species. Infrastructure and traffic could impose dispersal barriers to most non-flying terrestrial animals. While the loss of continuous available natural habitat would occur, large tracts of unaffected habitats in the region (e.g., land previously utilized by the WKWMA) would be able to support wildlife movement would still be available in direct proximity to the site.

In summary, construction of the GMPEF Site would noticeably alter the composition of habitat but would not destabilize the existence of these communities off site; therefore, direct and indirect impacts to existing vegetation and wildlife on site would be MODERATE.

4.6.1.2 *Impacts on Special Status Species*

4.6.1.2.1 Federally Listed Species

Similar to the analysis of impacts on vegetation and wildlife, but with less severity, direct and indirect impacts to federally listed species with potential to occur on site would be SMALL.

Construction of the GMPEF is not anticipated to result in adverse impacts on federally threatened and endangered species, as no federally listed species or designated critical habitats have been recorded within the GMPEF Site nor were any federally listed species observed during various onsite ecological resource surveys that took place in 2025 for Parcel A (CEC, 2025a; CEC, 2025b; CEC, 2025c) and 2026 for Parcel C (CEC, 2026a; CEC, 2026b; CEC, 2026c). Additionally, no federally listed species have been historically documented within the DOE Paducah Site (DOE, 2024b).

On October 28, 2025, the U.S. Fish and Wildlife Service (USFWS) sent a concurrence letter stating they agree with the effects determination statements made for federally listed species with potential to occur (Table 3-14) and that the requirements of Section 7 of the ESA have been fulfilled for this project (USFWS, 2025b) (refer to Appendix B, *Consultation Documents*, for a copy of the letter). Surveys conducted within Parcel C did not identify any federally listed or proposed listed species or habitats within the approximate 6.8 acre proposed switchyard area. As such, *no effects* would occur as part of construction and operation and additional consultation with the USFWS is not required.

Effects determination rationales for federally listed species are described below.

Indiana, Gray, and Tricolored Bats. Indiana and tricolored bats have potential suitable summer habitat within the GMPEF Site, however neither species were detected during recent mist net surveys (CEC, 2025b). It is possible either species may still traverse the site, notably because tricolored bats were acoustically detected in 2024 directly south of the GMPEF Project Area during surveys for the proposed PLEF (GLE, 2025). The primary threat to federally listed bat species in Kentucky is the loss and degradation of mature bottomland hardwood forests due to agricultural conversion and urban expansion. Habitat alteration has greatly reduced the amount of suitable summer roosting and foraging habitat. Tree clearing of mature upland forests is seen as a threat (KDFWR, 2025c). To offset direct impacts to federally listed bat species, the USFWS recommends tree removal occur between October 1 and March 31 to protect bats during their summer roosting, which typically lasts from April 1 to October 31, and pup-rearing seasons between May 15 to July 31 (USFWS, 2023).

Noise disturbance can cause behavioral changes, with bats avoiding loud areas and modifying their echolocation calls to navigate interferences. The degree of sensitivity varies by species, with some bats less affected by noise than others. While mist net survey did not detect Federal- or State-listed bat species, it is possible some may still traverse the site. For the GMPEF, it is expected that noise effects from construction would be short term and would only affect wildlife in the immediate vicinity. Those affected would generally be able to return to surrounding areas after construction is complete.

Many bat species can be sensitive to short-wavelength light (such as blue and ultraviolet) and cause them to avoid lit areas, thus disrupting foraging, migration, and roosting. As such, GeM will use low impact, warm-toned, low-intensity, and directional light for outdoor facility lighting when constructing and operating the GMPEF and avoid (where possible) unnecessary illumination altogether in an effort to minimize potential impacts (e.g., disorientation or disruption of nocturnal activities such as commuting and foraging) to bat species that may migrate through the area. These efforts, combined with the absence results of the mist net survey, indicate that implementation of the Proposed Action would have SMALL impacts on federally listed bat species.

It is anticipated that construction activities within the GMPEF Project Area *may affect but would not be likely to adversely affect* federally endangered Indiana bat and the federally proposed endangered tricolored bat. Additionally, there are no caves within the GMPEF Project Area for gray bats to inhabit. As such, implementation of the Proposed Action would have *no effect* on federally endangered gray bats.

Clams. Soil disturbance can potentially result in water quality impacts to streams through erosion and sedimentation. To minimize these impacts, GeM will develop a site-specific SWPPP and implement the best appropriate soil erosion prevention management practices to ensure waste materials, soil, and construction debris are contained. No clam species or potential suitable habitats were observed during the July 2026 Habitat Assessment Surveys that included streams within the entire Parcel C Site (CEC, 2026c). As such, the Proposed Action would have *no effect* on the federally listed clam species presented in Table 3-14.

Monarch Butterfly. Neither the monarch butterfly (federally proposed threatened) nor their host plant (milkweed - *Asclepias* sp.) were incidentally observed during the survey in late June or during the mist-net survey for Federal- and State-listed bats (CEC, 2025a; CEC, 2025b; CEC, 2025c) nor during the July 2026 Habitat Assessment Surveys within the entire Parcel C Site (CEC, 2026c). While sparse milkweed plants may possibly be present, it is unlikely that the GMPEF Site could support large populations of migrating monarch butterflies. As such, construction is not likely to jeopardize the continued existence of the federally proposed threatened species.

Migratory Birds. The undeveloped habitat within the GMPEF Site generally attracts many types of birds. While any habitat loss could adversely affect individual birds, the amount of impacted habitat is relatively small compared to similar habitats immediately available (e.g., the WKWMA). The USFWS recommends excluding vegetation clearing during migratory bird nesting season, generally occurring between March through August (USFWS, 2020). To comply with these recommendations and to reduce potential impacts to migratory bird species, tree clearing would occur outside of the migratory bird nesting season. Noise resulting from construction activities would be localized, short term, and only occur during daylight hours. As such, significant impacts to migratory birds (including Birds of Conservation Concern) would not be anticipated under implementation of the Proposed Action.

Bald and Golden Eagles. No bald or golden eagles or eagle nesting is known to occur at GMPEF Project Area or in the immediate vicinity and therefore impacts to sensitive nesting habitats would not occur. No significant impacts to eagles protected under the Bald and Golden Eagle Protection Act are anticipated to result from implementation of the Proposed Action.

4.6.1.2.2 State-Listed Species

Impacts on State-listed species with potential to occur on site would be SMALL.

S-Rank species identified by the Office of Kentucky Nature Preserves Biological Assessment Tool have not been historically documented within the DOE Paducah Site under the Paducah environmental management programs (DOE, 2024b) nor were any State-listed species observed during surveys conducted in 2025 for Parcel A (CEC, 2025a; CEC, 2025b; CEC, 2025c) and 2026 for Parcel C (CEC, 2026a; CEC, 2026b; CEC, 2026c). Only two species, State endangered Southeastern myotis and State threatened compassplant, have potential suitable habitat within the GMPEF Site. Impacts to these species would be considered SMALL, per the same rationale as previously discussed in the analysis of impacts on federally listed species.

4.6.1.3 *Impacts on Wetlands*

As described in Section 3.5.4, *Wetlands*, U.S. Army Corps of Engineers (USACE) granted an Approved Jurisdictional Determination for the 100-acre GMPEF Site within Parcel A and officially concurred with the

"no permit required" determination, thus satisfying compliance with Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act (USACE, 2025b). Additionally, the Kentucky Energy and Environment Cabinet issued concurrence that this project does not require a 401 Water Quality Certification due to the lack of jurisdictional impacts (refer to Appendix B, *Consultation Documents*, for a copy of the correspondence).

In compliance with Section 404 of the Clean Water Act, GeM will consult with USACE for impacts to any proposed Waters of the United States features and request a Jurisdictional Determination for waters identified within the proposed switchyard area in Parcel C. For impacts to jurisdictional waters, GeM will submit either an application for a Section 404 Nationwide Permit or an Individual Permit (for significant impacts) to the USACE Louisville District office. A 404 Nationwide or Individual Permit will be obtained prior to construction of the switchyard area. Additionally, GeM will coordinate with the KDOW office to obtain 401 Water Quality Certification

Construction of the GMPEF would not destabilize the existence of wetland communities off site; therefore, impacts to wetlands would be considered SMALL to MODERATE.

4.6.2 Operation

Operation of the GMPEF would not directly impact the ecological environment beyond what is discussed for vegetation and wildlife, special status species, and wetlands under Section 4.6.1, *Construction*, as the whole 107-acre site would be built out with little to no natural habitat remaining. Additionally, facility operation sound levels are estimated to be below EPA sound-level guidance and therefore would not likely disturb wildlife or Federal- or State-listed species (noises from the operation of the GMPEF are discussed in Section 4.8, *Noise and Vibration Impacts*).

Radiological exposure has different effects on ecological resources where some species are more sensitive than others. For the Proposed Action, radiological impacts on human health were used as a measure to determine the need to address the potential impacts on ecological resources as exposure pathways (e.g., inhalation, ingestion, and direct radiation) are expected to be the same. Radiological exposure from the Proposed Action would not differ significantly from current levels, and radiological impacts on human health was determined to be SMALL; therefore, impacts on ecological resources were considered to be SMALL and were not analyzed in detail. Furthermore, the project design provides additional structures, spill prevention, and management plans (e.g., wastewater discharge, waste management) that would contain and control any spills. Similarly, the GMPEF Site will have site controls and fencing to create a biological exclusion zone, which would further minimize exposure pathways to biota. Thus, any potential impacts on ecological resources caused from chemical spills are considered SMALL.

4.6.3 Decontamination and Decommissioning

As described in Section 2.1.2.1.3, *Decontamination and Decommissioning*, D&D of the GMPEF would involve the removal of all structures, roads and utilities, grading of the GMPEF Site, and establishing vegetative cover. Impacts from possible radiological exposure would be similar to or less than exposure during operation. The Decommissioning Plan and regulations by the NRC and EPA would minimize impacts to humans and, as a result, also afford protection to ecological resources. Impacts to ecological resources from D&D activities would be SMALL and beneficial after D&D is completed.

4.6.4 Cumulative Impacts

Impacts on ecological resources resulting from activities associated with the Proposed Action (specifically construction) would be considered cumulative. Development of the GMPEF in combination with the projects planned for the foreseeable future on and surrounding the GMPEF Project Area (as described in

Section 2.4, *Cumulative Effects*), could result in LARGE impacts to vegetation, MODERATE impacts to wildlife, SMALL impacts to special status species, and SMALL impacts to wetlands.

Vegetation and wildlife would be directly impacted through habitat loss from the permanent conversion of approximately 611 acres of terrestrial and aquatic land to industrial land during the operating life of the GMPEF (107 acres), PLEF (322 acres), and parcel to the east slated for development (188 acres), until the time of D&D. Land conversion would result in direct permanent effects to total available forested and herbaceous vegetation in the area resulting in LARGE cumulative impacts. However, it is anticipated that mobile wildlife (small and large mammals and avian species) would be able to relocate from the areas of removed habitat to adjacent areas where habitat is available. Implementation of mitigation measures, such as seasonal timing restrictions for land clearing for bat and bird active seasons, would help to prevent and minimize impacts to special status species and cumulative impacts are expected to be SMALL. The increase in impervious areas would result in increased stormwater runoff volumes. Stormwater increases would be addressed with development of BMPs and implementation of a SWPPP (see Section 4.5.2, *Surface Water Impacts*). BMPs would mitigate impacts on wetlands and waterbodies within the area. No Federal or State permits are required. Cumulative impacts to offsite wetland habitat are expected to be SMALL.

4.6.5 Control of Impacts

The Proposed Action would be reviewed by the appropriate Federal and State agencies for compliance with the applicable laws and regulations. Any additional surveys or mitigation measures required during the review process would be conducted as necessary. The ecological resources control measures that could be applied to the Proposed Action are further discussed in Section 5.5, *Ecological Resources*.

4.7 Air Quality Impacts

Construction, operation, and decommissioning activities associated with the Proposed Action would result in air emissions of criteria pollutants and hazardous air pollutants (HAPs). The following analysis evaluates the impact of projected emissions from the Proposed Action (Section 4.7.1) relative to air quality conditions within the project area and applicable Federal and State air pollution standards and regulations. A description of the projected cumulative air quality impacts assuming implementation of the Proposed Action is presented in Section 4.7.2. Air emissions controls planned to mitigate air quality impacts from the Proposed Action are discussed in Section 4.7.3

Radionuclide emissions would occur from the Proposed Action, and the impact of these emissions are evaluated in Section 4.12, *Public and Occupational Health Impacts*.

4.7.1 Proposed Action

4.7.1.1 *Construction*

Construction of the Proposed Action would require building and security fencing construction, and roadway and utility development. Air quality impacts from construction activities would result from (1) combustive emissions (such as volatile organic compounds, CO, and nitrogen oxides [NO_x]) due to the use of fossil-fuel-powered equipment, trucks, and worker commuter vehicles and (2) fugitive dust emissions (particulate matter with diameters less than 10 micrometers [PM_{10}]/particulate matter with diameters less than 2.5 micrometers [$PM_{2.5}$]) due to the operation of equipment on exposed soil.

Building and infrastructure development would occur from 2027 through 2028 and would include construction equipment usages and resulting air emissions. GeM plans to submit an air permit application to the State of Kentucky in the fourth quarter of 2026. However, air emissions produced by clearing, grubbing, and grading activities are considered permissible actions prior to Air Permit issuance under

Kentucky regulations. The project construction contractor would implement protective measures to minimize the generation of fugitive dust during construction and to comply with KAR Title 401, Chapter 063, Regulation 010 (401 KAR 63:010 [Fugitive Emissions]). Implementation of these measures would reduce fugitive dust emissions from active disturbed areas by up to 74 percent compared to uncontrolled levels (Countess Environmental, 2006). Section 5.6, *Air Quality*, presents air quality protective measures the GMPEF would implement to minimize air pollutant emissions and impacts from construction of the Proposed Action.

To determine the magnitude of air quality impacts that could occur from construction of the Proposed Action, the analysis relied on the air quality analysis of the PLEF to be developed adjacent to the GMPEF Site (GLE, 2025). The PLEF analysis provided estimates of air emissions that would occur from project construction. The PLEF Environmental Impact Statement (EIS) (NRC, 2026) evaluated facility construction over an area of about 322 acres, whereas construction of the GMPEF project would occur over about 107 acres. Therefore, emissions estimated for construction of the PLEF would be higher than those expected for construction of the GMPEF. The PLEF ER determined that air quality impacts from construction of the project would be SMALL. Therefore, due to its smaller size and smaller construction effort, air quality impacts from construction of the GMPEF also would be SMALL.

4.7.1.2 *Operation*

Air quality impacts from operations of the GMPEF would occur from (1) diesel-powered trucks that transport UF_6 feed material and enriched UF_6 product and DUF_6 material; (2) diesel-powered mobile equipment (such as forklifts and gantry cranes) that handle cylinders of UF_6 and DUF_6 within the cylinder storage pads, transfer cylinders between the storage pads and the main GMPEF uranium enrichment buildings, and load/unload cylinders onto trucks for shipment; (3) uranium compounds and hydrogen fluoride (HF) (a HAP) released from rooftop vents; (4) diesel-powered electric generators with a combined power output of 8 megawatt (MW) for use in the event of power outages (otherwise, operated 1 hour per month for routine maintenance testing); and (5) worker commuter vehicles. The region of influence for the air quality analysis includes the area surrounding the GMPEF and generally within a few miles of a proposed emission source.

The enrichment process would not require any continuous combustion activities and therefore would produce minimal amounts of criteria pollutant emissions. The process would generate minor amounts of uranium compounds and HF emissions. Some UF_6 gaseous releases would occur inside the operations building during the connection/disconnection of UF_6 cylinders and equipment maintenance. All air pollutant releases would be collected within buildings, then routed through a gaseous effluent ventilation system with pre-filters, high-efficiency gas adsorber, and high-efficiency particulate air (HEPA) filters that would remove uranium compounds and HF from process gas streams (as described in Section 5.6, *Air Quality*). The exhaust air stream from these emission controls would vent to the atmosphere and would meet regulatory discharge requirements for each pollutant. These air control systems would be subject to Kentucky Division for Air Quality air permitting requirements.

To determine the magnitude of air quality impacts that could occur from operation of the Proposed Action, the analysis relied on the air quality analysis of the [redacted] (Trade Secret / Confidential Commercial Information) of combined power output from diesel-powered emergency generators. Both of these functions exceed those proposed for the GMPEF, which include an SWU demand of several million ([redacted]) (Trade Secret / Confidential Commercial Information) and 8 MW of combined power output from diesel-powered emergency generators. Therefore, the air quality impact analysis for the [redacted](Trade Secret / Confidential Commercial

Information) would bound impacts expected to occur for the GMPEF. The [redacted] (Trade Secret / Confidential Commercial Information) proposal included a radiological air and HAP emissions control system [redacted] (Trade Secret / Confidential Commercial Information) that would be similar in control efficiency to those proposed for operation of the GMPEF.

The impact analysis of emissions that would occur from operation of the [redacted] (Trade Secret / Confidential Commercial Information) enrichment facility determined that the ambient impact of criteria pollutants and uranium compounds and HF would be lower than their respective regulatory levels, including the National Ambient Air Quality Standards (NAAQS) for criteria pollutants and OSHA Permissible Exposure Limit for HF. Therefore, the [redacted] (Trade Secret / Confidential Commercial Information) analysis concluded that potential air quality impacts from the operation of the facility would be SMALL [redacted] (Trade Secret / Confidential Commercial Information). Since the size of the GMPEF and the resulting SWU demand and diesel-powered emergency generator output would be smaller than those proposed for the [redacted] (Trade Secret / Confidential Commercial Information), air quality impacts from operation of the GMPEF would be less than those described for the [redacted] (Trade Secret / Confidential Commercial Information).

The [redacted] (Trade Secret / Confidential Commercial Information) air quality analysis conducted dispersion modeling to estimate the ambient impact of emissions from the proposed diesel-powered emergency generators. The analysis concluded that emission from the generators would not contribute to an exceedance of a NAAQS. However, due to recent updates of some NAAQS, the [redacted] (Trade Secret / Confidential Commercial Information) analysis would show exceedances of the more stringent 24-hour and annual $PM_{2.5}$ and new 1-hour NO_x NAAQS. It is expected that operation of the diesel-powered emergency generators proposed for the GMPEF would result in substantially lower ambient impacts compared to the results of the [redacted] (Trade Secret / Confidential Commercial Information) analysis and would comply with all NAAQS for the following reasons:

- The [redacted] (Trade Secret / Confidential Commercial Information) analysis assumed the use of diesel fuel with a much higher sulfur content compared to the use of currently mandated ultra-low sulfur diesel. Use of ultra-low sulfur diesel would produce lower emissions of $PM_{2.5}$ compared to the use of higher sulfur fuel.
- The [redacted] (Trade Secret / Confidential Commercial Information) would operate diesel-powered generators with a collective power rating that is about 2.6 times greater than those proposed for the GMPEF. Use of the GMPEF generators would result in substantially lower emissions of NO_x and $PM_{2.5}$.
- The [redacted] (Trade Secret / Confidential Commercial Information) analysis conservatively assumed that each emergency generator would operate 500 hours per year. Under 40 CFR 60.4211(f)(3), emergency stationary engines may be operated a maximum of 100 hours per calendar year for maintenance and testing and 50 hours per calendar year in non-emergency situations. The 50 hours of operation in non-emergency situations are counted as part of the 100 hours per calendar year. Assuming 100 annual hours of operation for the GMPEF generators, annual air emissions from these units and resulting ambient impacts would be lower than analyzed for the [redacted] (Trade Secret / Confidential Commercial Information).

Air quality impacts from the GMPEF would be greatest directly adjacent to the project site. Trucks and vehicles that access the project site would produce more dispersed and intermittent air quality impacts along local and regional roadways that link to the project site.

In conclusion, impacts from criteria pollutant and HAP emissions from operation of the GMPEF would remain below the NAAQS and HAP regulatory levels. Therefore, air quality impacts that would result from GMPEF operations would be SMALL.

4.7.1.3 *Decontamination and Decommissioning*

D&D of the GMPEF would require decontamination and the removal of equipment, demolition of buildings and infrastructure, and the transport of materials off site to landfills and recycling facilities. Air quality impacts from these activities would result from sources similar to project construction and include (1) combustive emissions due to the use of fossil-fuel-powered equipment, trucks, and worker commuter vehicles and (2) fugitive dust emissions due to demolition activities and the operation of equipment on exposed soil. Similar to project construction, the project D&D contractor would implement protective measures to minimize the generation of fugitive dust during D&D activities and to comply with 401 KAR 63:010 (Fugitive Emissions).

Air emissions from D&D would be lower than those estimated for project construction, as the activity would require less intensive equipment usage. Therefore, air quality impacts from D&D of the GMPEF would be SMALL.

4.7.2 Cumulative Impacts

Future projects that emit air emissions within the air quality region of influence (ROI) could combine with emissions from the GMPEF and result in cumulative impacts. Currently, McCracken County attains all NAAQS. Due to its remoteness, emissions emanating from the GMPEF during construction, operation, and decommissioning are not expected to substantially combine with emissions from other sources within the ROI. Therefore, cumulative impacts resulting from implementation of the Proposed Action, in conjunction with reasonably foreseeable future actions within the ROI, are not expected to exceed any NAAQS or regulatory level for HAPs. Therefore, the Proposed Action would not substantially contribute to the SMALL cumulative air quality impacts.

4.7.3 Control of Impacts

The Proposed Action would implement a comprehensive program that incorporates air emissions controls during proposed construction, operation, and D&D activities. Components of this program would include the following:

<u>Construction</u>

Potential measures that would mitigate fugitive dust emissions during construction include the following:

- Water the GMPEF Site and unpaved roads when dust emanates from these areas.
- Implement speed limits for vehicles traveling on paved and unpaved roads.
- Remove dirt from truck tires by driving over a gravel pad prior to leaving the GMPEF Site or unpaved access road to avoid spreading sediments on paved roads.
- Cover trucks that carry soil and debris to reduce dust emissions while driving on roadways.
- Pave the access road and parking lots as soon as practicable.

<u>Operations</u>

Control systems and measures that would lessen the release of air emissions from planned operations include the following:

- Maintain process areas inside the GMPEF enrichment buildings under continuous negative pressure relative to atmospheric pressure, which would prevent the outflow of unfiltered air in the event of a gaseous release in one of the process areas, effectively containing the released gaseous material.
- Ventilate enrichment buildings with a high-efficiency, multi-stage air emissions control system. Components of the air emissions control system would collect air pollutant releases within buildings, then route through a gaseous effluent ventilation system with pre-filters, high efficiency gas adsorber, and high efficiency particulate air filters to remove uranium compounds and HF from process gas streams. Exhaust gases from this emission-control system would be vented to the atmosphere through a stack for each module.
- Implement a periodic inspection and maintenance program for Depleted-up-to-Natural UF_6 cylinders stored on the outdoor cylinder storage pad.
- Store organic solvents, paints, and other liquids containing volatile organic compounds in containers covered with tightly fitting lids.

The air emissions control measures that would be applied to the Proposed Action are further discussed in Section 5.6, *Air Quality*. For additional descriptions of control measures that would reduce radionuclide emissions from the Proposed Action, see Section 5.11, *Public Health*.

4.8 Noise and Vibration Impacts

This section discusses the analysis of noise impacts anticipated from the GMPEF to the surrounding environment. The following sections provide descriptions of the acoustical terms and details the sound level impacts from the GMPEF.

4.8.1 Proposed Action

This section discusses potential noise impacts associated with each component of the Proposed Action. Noise impacts are assessed by considering noise and vibration levels generated by Proposed Action activities in the context of the affected environment (described in Section 3.7, *Noise and Vibration*). Impact discussions in this section focus on potential impacts to the community. Potential noise impacts of the Proposed Action on wildlife are assessed in Section 4.6, *Ecological Resources Impacts*.

4.8.1.1 *Construction*

Construction activities would likely to generate short duration noises resulting from use of heavy construction equipment types that are typical of commercial or industrial building construction activities. Traffic accessing the construction site would increase, but most of the traffic would consist of smaller passenger car or pick-up truck-type vehicles, which are estimated to have a SMALL noise impacts to the community.

Heavy equipment used for Proposed Action activities would generate locally elevated noise levels while construction is under way. The activities would take place during daytime hours and workers would wear hearing protection in accordance with applicable workplace hearing conservation regulations. Table 4-7 lists maximum and equivalent noise levels generated by representative equipment types at the reference distance of 50 feet and at the closest noise-sensitive location, a residence 4,300 feet south of the GMPEF Site (see Section 3.7.1, *Baseline Sound Conditions*).

Table 4-7: Noise Levels Generated by Representative Equipment Types

Equipment Description	Maximum Noise Level (dB) at Distance (ft)		Default Usage Factor (% of Workday)	L_{dn} (dBA) at Distance (ft)	
	50	4,300		50	4,300
Scraper	84	45	40	75	37
Dozer	82	43	40	73	35
Grader	83	44	40	74	36
Front End Loader	79	40	40	70	32
Roller	80	41	20	68	30
Dump Truck	76	37	40	67	29
Water Truck (Flat Bed)	74	35	40	65	27
Overall Combined	89	51	n/a	80	42

Key: % = percent; dBA = A-weighted decibel; L_{dn} = day-night average sound level; ft = feet; n/a = not applicable

Note:
Equipment reference noise levels, default usage factors, and calculation methods used to estimate maximum and time-averaged noise levels at distances greater than the reference distance are in accordance with the Federal Highway Administration's Roadway Construction Noise Model (FHWA, 2006). Estimated noise levels assume no shielding (as would be provided by stands of trees or structures) and assume that all equipment would be operating at the closest location on the parcel to the sensitive location. Therefore, results shown are conservative, and may overestimate actual noise levels.

During a hypothetical time at which all of the listed equipment types are in operation simultaneously, the combined maximum noise level at the closest noise sensitive location would be 51 A-weighted decibels (dBA) (Table 4-7). As noted in Section 3.7.1, *Baseline Sound Conditions*, 1-hour noise levels measured at two locations along Woodville Road ranged from 43 to 57 dBA L_{50}. During times in which ambient sound levels (i.e., sound other than those generated by the Proposed Action) are higher than noise levels generated by the Proposed Action, noise associated with the Proposed Action would not be distinctly audible. Vehicular traffic associated with the Proposed Action would incrementally increase traffic on nearby roads, generating individual pass-by noise levels comparable to existing traffic on these roads.

Because heavy equipment usage would be limited to daylight hours, the dB penalty applied in calculation of the day-night average sound level (L_{dn}) metric for nighttime noise events would not be incurred. Table 4-7 lists time-averaged noise levels reflecting the default usage factor for each equipment type (i.e., the percentage of the workday during which the equipment is in use). The time-averaged noise level for a day in which all equipment is operating would be 42 dBA L_{dn}, which is well below the 55 dBA level recommended by EPA as protective of human health and welfare with an adequate margin of safety.

The equipment type generating the highest ground vibration levels would be a drill rig, which generates 87 decibels of vibration velocity (VdB) at the reference distance of 25 feet (FTA, 2018). Ground vibration attenuates with distance by a VdB value that is the logarithm of the ratio of the receptor distance to the

reference distance multiplied by a factor of 30 (FTA, 2018). Using this generalized relationship, it can be estimated that vibration levels would be reduced to levels that are imperceptible (i.e., less than 65 VdB) within approximately 150 feet of the source activity (e.g., a drill rig). The U.S. Federal Transit Administration (FTA) *Transit Noise and Vibration Impact Assessment Manual* indicates that vibration from trucks along roadways is unlikely to be perceptible, even if the receptor is close to a major roadway (FTA, 2018).

Construction activities would continue to occur only during daytime hours and would be temporary, occurring only while construction is under way. At the closest sensitive location, noise levels would remain below FTA noise criteria (65 dBA L_{dn}) and vibrations would be imperceptible. Therefore, impacts on the residential properties to the south of the GMPEF from construction are anticipated to be temporary and SMALL.

4.8.1.2 *Operation*

Operational noise and vibration from the GMPEF is anticipated to have no adverse impact to the residents to the south (i.e., a SMALL noise impact). Equipment to be used by the GMPEF would primarily be housed within the uranium enrichment buildings, with limited noise generated from outdoor equipment and substation transformers. Representative equipment types, such as electrical transformers, when sized appropriately for industrial applications, generate approximately 75 dBA at a distance of 3 feet (GLE, 2025). If no acoustic shielding is assumed to be provided by intervening structures or vegetation, noise generated by such equipment would be well below ambient sound levels at the closest noise-sensitive location to the GMPEF Site (a residence 4,300 feet away) and therefore not distinctly audible. Vehicular traffic associated with day-to-day operations would generate pass-by noise levels similar to ongoing traffic, and effects would be limited to an incremental increase in the number of pass-by events at locations along nearby roads. Vibrations associated with operational activities would not be perceptible at the closest sensitive location.

Facility operation noise levels would remain well below FTA noise criteria and vibrations would be imperceptible at the closest sensitive location. Therefore, SMALL impacts are estimated to the surrounding residential areas from operation of the GMPEF.

4.8.1.3 *Decontamination and Decommissioning*

D&D of the GMPEF would produce sound levels similar to those generated from GMPEF construction activities. The majority of noise producing activities would involve deconstructing equipment (see Section 2.1.2.1.3, *Decontamination and Decommissioning*) and hauling the materials off site. Anticipated noise would be similar to that expected during construction and therefore impacts are estimated to be SMALL.

4.8.2 Cumulative Impacts

As described in Section 2.4, *Cumulative Effects*, the DOE Paducah Site lies to the north of the GMPEF Site and there are several offsite projects scheduled to occur within the vicinity of the GMPEF. This includes the new PLEF (GLE, 2025) proposed to be constructed adjacent to the GMPEF, and the turnover of areas to the east of the GMPEF Site for industrial development (DOE, 2025a).

As discussed in PLEF ER Section 4.7, PLEF construction would generate 53 dBA L_{dn} at the closest sensitive location (GLE, 2025). This is more than 10 dBA louder than the 42 dBA L_{dn} generated by the Proposed Action construction at the same location. If the Proposed Action and PLEF construction were to overlap in time, the contribution of noise generated by the Proposed Action to the overall noise level would be negligible. Like the GMPEF, construction of the PLEF would be completed in phases until all enrichment modules are constructed. Construction noise would be louder than operational noise.

Potential impacts associated with turnover of areas to the east of the GMPEF Site for industrial development have not yet been assessed, but effects would likely be similar to those associated with construction and operation of the PLEF. Cumulative effects of the Proposed Action with potential future activities in areas east of the GMPEF if the two actions were to overlap in time would be expected to be negligible for reasons similar to those presented above relating to cumulative impacts with the PLEF.

In summary, there could be a cumulative effect of combining the existing ambient noise and the noise from the PLEF, development to the east of the GMPEF, and GMPEF activities since these activities may overlap in time. Due to the distance from the GMPEF Site boundary to the nearest residential receptors to the south, and the nature of sounds emitted during construction, operation, and D&D, the additional noise from the GMPEF is not anticipated to substantially add to the cumulative noise impacts to the community. Because the combined effects of the Proposed Action with other separate actions on overall noise levels at sensitive locations would be expected to be negligible, cumulative impacts on noise and vibration are expected to be SMALL.

4.8.3 Control of Impacts

As indicated in the noise and vibration impact analyses, there may be temporary noise impacts during construction and D&D. Noise mitigation would focus on construction type activities. Various mitigation options would be considered. Examples include:

- Maintaining manufacturer's noise-control devices (e.g., mufflers) on construction equipment in effective operating condition.
- When possible, utilizing quieter equipment or methods to minimize noise during an activity.
- When possible, operating equipment with internal combustion engines at the lowest operating speed to minimize noise.
- Avoiding equipment engine idling.
- Utilizing quieter, back-up alarms on construction equipment; these alarms must comply with all applicable safety requirements, such as OSHA standards.

Other noise mitigation, such as equipment-specific noise control or temporary noise barriers, could be implemented if adverse impacts are observed during construction or D&D.

Although the impact analyses indicate that there would be SMALL noise impacts from GMPEF operations, noise control could be considered, to reduce sound-level impacts at the property lines. Options including low-noise equipment or noise barriers for outdoor equipment to reduce the transmission of noise to the property lines.

4.9 Historical and Cultural Resources Impacts

Cultural resources refer to the physical evidence or places of past human activity, including prehistoric and historic sites, structures, objects, artifacts, and landscapes with cultural, historical, archaeological, or architectural significance. In accordance with the National Environmental Policy Act (NEPA), Federal agencies must identify, evaluate, and disclose potential impacts to cultural resources caused by Federal actions. This process is often coordinated with Section 106 of the National Historic Preservation Act (NHPA) and other relevant laws.

Cultural resources are protected under several Federal and State laws, most notably NHPA of 1966, as amended (Title 54 U.S.C. § 300101 et seq.). Section 106 of the NHPA requires Federal agencies to consider the effects of their undertakings on historic properties—defined as any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places

(NRHP) (36 CFR 800.16(l)(1)). Consultation with the Kentucky State Historic Preservation Officer (SHPO), Native American tribes, and other interested parties is also necessary to identify historic properties, assess adverse effects, and develop measures to avoid, minimize, or mitigate any adverse impacts. The project must also adhere to the standard operating procedures and stipulations in the Integrated Cultural Resources Management Plan and agreement documents, respectively. Compliance with the NHPA, as well as Kentucky State regulations and DOE/DOE-licensed property requirements, is mandatory for all Proposed Action activities.

Activities restrictions, limitations, and mitigation measures are set forth in these documents to protect the cultural resources. The existing cultural resources within the Area of Potential Effect (APE), as analyzed in accordance with these documents, were scrutinized for condition and evaluated to determine the effects of the Proposed Action on the existing resources.

The APE for this undertaking is not assumed to extend beyond the GMPEF site boundaries (Parcels A and C) where direct impacts from ground-disturbing activities may occur. This site boundary is identified in Figure 1-2. An additional buffer to account for potential indirect effects (visual, auditory, atmospheric) to historic properties is not necessary for this project as the planned construction and operation of the GMPEF is consistent in appearance, nature, and function to the broader PGDP. As a result, any potential effects to cultural resources would be limited to ground disturbing activities.

The level of impact on historic and cultural resources (referred to as cultural resources for simplicity) and the impact's potential significance is determined by how the effects of the Proposed Action could impact the cultural resource in terms of context, intensity, and duration. This section reviews the APE and considers the effects the Proposed Action will have on cultural resources.

4.9.1 Direct Impacts

Direct effects from the undertaking may include physical, visual, auditory, or olfactory effects to cultural resources (NRC, 2026). The proposed physical APE is defined as the entire GMPEF Site and switchyard area, which is where direct impacts from ground-disturbing activities during construction would occur. There is the potential for localized impacts from inadvertent cultural resource discoveries.

Operation of the facility would not damage historic properties, because no cultural resources have been included in, or identified as eligible for inclusion in, the NRHP. As they would not be physically affected by the GMPEF, no adverse effect to historic properties is anticipated from operation of the facility.

4.9.2 Indirect Impacts

Indirect effects may include physical, visual, auditory, or olfactory impacts; however, indirect effects are those caused by the undertaking that occur later in time or are foreseeable. The proposed indirect APE includes a buffer around the physical APE to account for potential non-physical effects (e.g., visual, auditory, atmospheric) to cultural resources. It extends 0.25 miles (400 meters) around the GMPEF Site.

NRHP records indicated that no properties included in, or properties listed as eligible for inclusion in, the NRHP are situated within the current GMPEF Site or within a 2-kilometer radius of the project area (Martin, 2025b; Martin, 2025a). No indirect effects would be anticipated from project implementation. The Proposed Action would create a facility similar in character to the DOE Paducah Site facilities adjacent and to the north of the site.

4.9.3 Agency Consultation

Concurrence with these findings by the Kentucky SHPO was received on July 3, 2025, and August 1, 2025. The concurrence with the determination of effect and archaeology report was obtained by Four Rivers Nuclear Partnership, in consultation with the SHPO (Martin, 2025a).

The 2006 Cultural Resource Management Plan (DOE, 2006) provides procedures for managing cultural resources on the DOE Paducah Site. It was determined DOE will either conduct archaeological surveys or consult with the Kentucky SHPO on the need for such surveys, only when a ground-disturbing activity is proposed in previously undisturbed areas of the DOE property. The GMPEF was leased from DOE, so all requirements of the 2006 Cultural Resource Management Plan apply.

4.9.4 Historic Preservation

No historic preservation activities are recommended due to lack of historic properties within the APE.

4.9.5 Potential for Human Remains

As the local landscape has been inhabited from prehistoric time to the present day, the potential exists to discover human remains. If human remains and/or funerary objects such as a coffin or completely intact aboriginal pottery are discovered during land-clearing and construction activities, the following actions are to be taken:

- All disturbance of the ground surface in the area shall cease and the discovery will be secured from further harm until further notice.
- The landowner (DOE) and local authorities shall be immediately informed of the discovery.

4.9.6 Cumulative Impacts

Cultural resources are a finite record of the past. The more impacts from construction projects, human degradation, and environmental decay a resource endures, the less integrity it possesses. The National Historic Preservation Act is crucial to mitigating these effects through preservation and regulation of cultural resources. When construction plans avoid archeological sites and limit ground-disturbing activities inside sites, the cumulative effects are mitigated.

The Proposed Action within the APE would not impact cultural resources as no historic properties are present. Construction and operation of the GMPEF would not add to cumulative impacts due to a lack of affected properties within the APE.

4.9.7 Control of Impacts

No adverse impacts to cultural resources would be anticipated due to lack of NRHP properties within the APE. Therefore, no mitigation measures are anticipated to be needed.

4.10 Visual/Scenic Resources Impacts

The visual and scenic characteristics of the GMPEF Site and its vicinity are described in Section 3.9, *Visual/Scenic Resources*, and photographs showing views of the GMPEF Site from different viewpoints are presented in Figures 3-29 through 3-45 Figure 3-27 and Figure 3-30 through Figure 3-46 and discussed in Section 3.9.2, *GMPEF Site Photographs*. This section describes the potential visual/scenic resources impacts projected to result from the Proposed Action (Section 4.10.1). A description of the projected cumulative visual/scenic resources impacts assuming implementation of the Proposed Action is presented in Section 4.10.2. Measures to mitigate the visual/scenic resources impacts for the Proposed Action are discussed in Section 4.10.3 and Section 5.9.

As described in Section 3.9.3.1, *Affected Residents*, the closest residents to the GMPEF Site are located approximately 4,300 feet south of the GMPEF Site along Woodville Road. There are residences located approximately 5,600 feet east of the GMPEF on Crotzer Road, but views of the GMPEF from those residences would be shielded by forested areas. The height of the trees generally ranges from 50 to 70 feet (NRC, 2026). Residences to the west are approximately 1.7 miles away and are shielded by forested areas

previously utilized by the WKWMA. There are no residences located north of the GMPEF that could be affected.

4.10.1 Proposed Action

Under the Proposed Action, a uranium-enrichment facility would be located at the GMPEF Site.

4.10.1.1 *Compatibility and Compliance with Regulations, Ordinances, and Requirements*

The GMPEF Site is zoned heavy industrial. There are no height restrictions in the McCracken County Zoning Ordinance for properties in the heavy industrial designation (GLE, 2025). Also, no visual compatibility compliance requirements were identified that would be applicable to the GMPEF.

4.10.1.2 *Construction*

The construction of the GMPEF would require clearing trees and vegetation, excavation and grading of the GMPEF Site (evaluated in DOE/EA-2327), construction of buildings and other structures, and connection to existing utilities outside of the GMPEF property boundaries. As discussed in Section 2.1.2.1.1, *Construction Activities*, approximately 6.8 acres of land would need to be cleared and rough graded, which will be evaluated by the appropriate regulatory authority in a separate NEPA analysis. All utilities would be underground, with the exception of the aboveground electric power lines. The tallest structures during construction would likely be cranes that could be 300 feet tall. Construction would be performed during daylight hours so night lighting should not be a substantial concern.

Temporary visual intrusions into the landscape would result from the use of 300-foot tall construction cranes at the GMPEF Site for erecting building structures and installing equipment during the 2-year construction period. No other visual/scenic resource impacts are expected to result from the activities performed for construction of the GMPEF; therefore, the visual/scenic resource impacts resulting from construction for the GMPEF would be MODERATE but temporary to offsite receptors.

4.10.1.3 *Operation*

The layout of the GMPEF is shown on Figure 1-3. An artist rendering of facilities at the GMPEF Site is provided on Figure 1-4. The dominant structure for the GMPEF that could create visual intrusions into the landscape would be the main GMPEF uranium enrichment building and air emission stacks. The building would be approximately 71 feet tall. There would be nine air emission stacks that extend a minimum of 72 feet above the ground floor. Lighting would be designed and installed in compliance with all regulations and would be designed to minimize light pollution.

4.10.1.3.1 BLM Visual Resource Management System Scenic Quality Rating

As described in the PLEF ER (GLE, 2025), the Bureau of Land Management (BLM) Visual Resources Management System (VRMS) was originally developed to facilitate management decisions in the national parks and wilderness areas that are under the jurisdiction of the U.S. Department of the Interior. The VRMS provides general guidelines for assessing the aesthetic and scenic quality of an area. The central component of the inventory stage of the VRMS is the scenic-quality evaluation. A scenic quality evaluation using the BLM VRMS methodology was performed for the GMPEF Site, as described in Section 3.9.8.1, *Scenic-Quality Evaluation*. An overall score of 6 was assessed for the GMPEF Site, which corresponds to a low scenic-quality rating (Grade C). The scenic quality evaluation results were combined with results of a sensitivity analysis and distance zones delineation assessment (see, respectively, Section 3.9.8.2, *Sensitivity-Level Analysis*, and Section 3.9.8.3, *Distance-Zones Delineation*) to assess which one of the BLM visual resource inventory classes is applicable to the GMPEF Site. The GMPEF would be located in an area designated under the VRMS as Management Class IV (see Section 3.9.8.4, *Determination of Visual Resource Inventory Classes*). The BLM management objectives for Class IV areas allow for high levels of

change, with the understanding that an attempt is made to minimize the visual impacts of the planned disturbance. The Proposed Action is compatible with the BLM's Class IV management objectives.

4.10.1.3.2 Potential Significant Visual Impact Features

The main GMPEF uranium enrichment buildings and stacks would be the highest structure at the GMPEF. Assuming an approximate total height of 71 feet for the building and 72 feet for the stack, the GMPEF would add to the visual intrusions in the existing landscape. The GMPEF uranium enrichment buildings would be visible from certain offsite viewpoints (primarily views from vehicles traveling on Hobbs Road and Dyke Road), but since these roads are not publicly accessible, this is considered to be a SMALL impact.

The relatively flat elevation of the GMPEF Site and surrounding area and the existing 50 to 70 feet high trees in the nearby offsite areas, would mitigate visual impacts from viewpoints in the middle ground and background. There are no residences located north of the GMPEF that could be affected. The area immediately north of the GMPEF Site has been developed for the DOE Paducah Site and has restricted access, also reducing the potential for visual/scenic impacts. Regardless of the actual visibility of the GMPEF, given the nature and scale of existing industrial facilities at the DOE Paducah Site to the north, adding these structures to the GMPEF Site would not be out of character with the visual elements and architectural features already present on this landscape.

The area immediately east of the GMPEF is currently undeveloped, forested and agricultural land within a land parcel that DOE is turning over for industrial use (DOE, 2025a). There are residences located approximately 5,600 feet east of the GMPEF on Crotzer Road, but views of the GMPEF from those residences would be shielded by forested areas.

The area immediately west of the GMPEF Site is land previously utilized by the WKWMA for wildlife management (see Section 3.1.6, *Zoning of the GMPEF Site and Vicinity*). Residences to the west are approximately 1.7 miles away and are shielded by forested areas of land previously utilized by the WKWMA.

As described in the PLEF EIS (NRC, 2026) the tree buffer along Woodville Road ranges from 50 to 70 feet in height, blocking viewpoints of the PLEF from nearby residences on Woodville Road (Figure 3-29). The GMPEF would be even further from these residences. The visual/scenic resource impacts for people living in residential developments to the south of the GMPEF Site are expected to be SMALL.

In addition, the proposed PLEF structures would not visually impact any known historical, archaeological, or cultural resources on or in the vicinity of the PLEF Site (NRC, 2026). Likewise, the GMPEF would not visually impact any known historical, archaeological, or cultural resources on or in the vicinity of the GMPEF Site. Additionally, the GMPEF structures would not be out of character with the adjacent DOE Paducah Site and the zoning designations for the surrounding land.

4.10.1.3.3 Operation Impact Summary

The GMPEF would be compatible with the GMPEF Site's BLM VRMS Management Class IV designation. The visual/scenic resource impacts of GMPEF operations at viewpoints outside of the GMPEF Site property boundaries would be mitigated by the relatively low profile of the buildings and other proposed GMPEF structures and the vegetation buffers. Given the nature and scale of the DOE Paducah Site to the north, adding these structures to the GMPEF Site would not be out of character with the visual elements and architectural features already present in the landscape near the GMPEF Site. The proposed GMPEF structures would not be visible from nearby residences. The proposed GMPEF structures would neither visually impact any known historical, archaeological, or cultural resources on or in the vicinity of the GMPEF Site, nor create visual elements that are out of character with the GMPEF Site vicinity; and would

not be visible from nearby residences; therefore, the visual/scenic resource impacts resulting from operation of the GMPEF would be SMALL.

4.10.1.4 *Decontamination and Decommissioning*

As described in Section 2.1.2.1.3, *Decontamination and Decommissioning*, D&D of the GMPEF would involve the removal of all structures, roads and utilities, grading of the GMPEF Site, and establishing vegetative cover. Impacts during D&D would be similar to impacts during the construction period and therefore would be MODERATE but temporary. Visual resources impacts after D&D are expected to be beneficial.

4.10.2 Cumulative Impacts

As described in Section 2.4, *Cumulative Effects*, the DOE Paducah Site lies to the north of the GMPEF Site and there are several offsite projects scheduled to occur within the vicinity of the GMPEF. This includes the new PLEF (NRC, 2026) proposed to be constructed adjacent to the GMPEF, and the turnover of areas to the east of the GMPEF Site for industrial development (DOE, 2025a).

The cumulative visual/scenic resources impact of the GMPEF with other planned projects (including the PLEF and turnover of areas to the east of the GMPEF Site for industrial use) would represent a significant change in the overall visual character and value of the landscape in the vicinity of the GMPEF Site. Therefore, it is expected that the cumulative visual/scenic resource impacts resulting from the GMPEF and other projects in the area would be MODERATE. Because of the location of the GMPEF at some distance from nearby residents, the GMPEF would not substantially contribute to cumulative impacts except during the anticipated 2-year construction and D&D periods when 300-foot cranes may be used.

4.10.3 Control of Impacts

Visual/scenic resource impacts resulting from the GMPEF could be mitigated by measures that would be incorporated into the GMPEF design. These mitigation measures may include the following:

- Use exterior building colors and facility landscaping to soften the visual impact.
- Following construction, restore all disturbed areas not used for permanent facilities to vegetated conditions.
- Revegetate tree buffers, if possible, to screen views.
- Incorporate lighting that is designed to minimize light pollution and offsite impacts.

Each of these visual/scenic resource impact mitigation measures for the GMPEF are also discussed in Section 5.9, *Visual/Scenic Resources*.

4.11 Socioeconomic Impacts

Construction and operation of the GMPEF would bring new workers and their families to western Kentucky and would create new tax revenue for the area. As a result, the GMPEF could impact population, economic, and social characteristics of the region over the life of the facility. This section examines these impacts and is organized as follows: Section 4.11.1, *Proposed Action*, discusses how constructing, operating, and decommissioning the GMPEF would impact the population, economic, and social characteristics of the region; and Section 4.11.2, *Cumulative Socioeconomic Impacts*, provides an analysis of cumulative socioeconomic impacts.

4.11.1 Proposed Action

The construction work force is expected to be up to 600 employees working one 10-hour shift per day, 6 days per week. The types of construction workers needed are expected to include heavy equipment

operators, ironworkers, welders, carpenters, electricians, pipe fitters, plumbers, and other skilled and unskilled workers.[7]

Operations are expected to begin in 2028 and run the 40-year duration of the NRC license until 2068.[8] The operations workforce is expected to be 140 employees working 24/7 (likely three 10-hour shifts per day, 7 days per week). The proposed $1.5 billion project is expected to create an estimated $71 million in recurring annual economic benefit for the region (WNN, 2025).

As described in Section 2.1.2.1.3, *Decontamination and Decommissioning*, D&D of the GMPEF would involve the removal of all structures, roads and utilities, grading of the GMPEF Site, and establishing vegetative cover. D&D would begin in 2068 and last 5 years. GeM is assuming a similar workforce for D&D as for construction.

4.11.1.1 *Population Impacts*

4.11.1.1.1 Construction

The direct population impact of constructing the GMPEF would depend on how many workers are obtained from within McCracken and Ballard Counties. For example, if workers are obtained from within this region, there would be no change in the region's total population; however, if workers move in from outside the area, potential impacts on regional demography could occur.

For the PLEF ER (GLE, 2025) an interview with Greater Paducah Economic Development (GPED) was conducted to obtain information on the availability of the region's workforce to support the needs of the PLEF (GLE, 2025; BMcD, 2024). According to the GPED representative, the labor force within the eight-county region, referred to as the Purchase Area Development District (PADD), should be able to adequately supply the construction and skilled trades needed to construct the PLEF. The representative noted that the City of Paducah and McCracken County in particular, have the workforce to support such a project levied across all trades (GLE, 2025).

Given the potential for migration of workers from outside the region, a range of population impacts are possible. This analysis assumes that 20–40 percent of the GMPEF construction labor force would be obtained from outside the two-county region. These low and high ranges were chosen to reflect the underlying uncertainty about what share of the labor force would come from outside the region. Using these assumptions, approximately 40 to 80 of the 200 construction workers would be expected to enter the region during GMPEF construction.

If construction workers move into the region with families, their total impact on the population would be larger. NRC data and experience with nuclear facility-related construction projects indicate that approximately 65 percent of individuals who move into a region for construction jobs bring their families, which consist, on average, of the worker, a spouse, and one school-aged child (GLE, 2025; NRC, 1994). Therefore, construction are estimated to increase the population level by approximately 92 to 184 individuals between 2025 and 2028 (40 to 80 workers, multiplied by 65 percent, multiplied by 3). This would represent an increase in the total population of the region of 0.25 percent over baseline projections during those years (184 new individuals divided by 74,948 regional population in 2025).

Although the above analysis implies that new construction workers and their families would be spread throughout the region, it is possible they might concentrate in McCracken County. McCracken County has

[7] All employee estimates related directly to the GMPEF have been rounded to the nearest multiple of 10, while all monetary values directly related to the GMPEF have been rounded to the nearest multiple of 1,000.
[8] After the initial 40-year license period, the GMPEF is eligible for up to two potential 20-year license renewal periods.

the most housing units for sale or rent, making it easier for families to find a home (1,345, or 47 percent, of the region total in 2020) (GLE, 2025). Additionally, the GMPEF would be located in McCracken County, and therefore the county would be attractive to workers wanting to locate close to their work. However, even if all workers and their families locate in McCracken County during construction, this would increase the population by about 0.28 percent (184 new individuals divided by 66,781 McCracken County population in 2025).

These calculations suggest that the number of new individuals moving into the region during construction would be small compared to the existing population. In addition, the impact these workers would have on the population would be temporary because many new workers would likely leave the region after construction of the GMPEF is completed. As a result, this analysis concludes that construction of the GMPEF would have a SMALL impact on the regional population.

4.11.1.1.2 Operation

Based on a review of the demographic characteristics of the GMPEF Site, data obtained from the PADD (GLE, 2025), and an interview with GPED (GLE, 2025), the eight-county PADD including McCracken and Ballard Counties would likely be able to provide the workforce needed to operate the GMPEF. This analysis assumes that 20 percent of the GMPEF operations workforce would be obtained from outside the two-county region (28 workers). NRC data and experience with nuclear facility-related projects indicates that 65 percent of new construction workers moving into a region would bring families, which consist, on average, of the worker, a spouse, and one school-aged child (GLE, 2025; NRC, 1994). If this assumption holds for operation workers, approximately 64 individuals would be added to the population of the region (28 workers, multiplied by 65 percent, multiplied by 3, plus 9). The 64 new residents would represent a less than 0.1 percent increase in the projected population level (64 new individuals divided by 74,640 regional population in 2030). If all 64 individuals are concentrated in McCracken County, this would result in less than 0.1 percent increase in that county's population in 2030 (64 new individuals divided by 66,567 McCracken County population in 2030).

This analysis demonstrates that operation of the GMPEF would result in small increases in the region's population (less than 0.2 percent). As a result, the analysis concludes that the impacts of operating the GMPEF on the regional population would be SMALL.

4.11.1.1.3 Decontamination and Decommissioning

As described in Section 2.1.2.1.3, *Decontamination and Decommissioning*, D&D of the GMPEF would involve the removal of all structures, roads and utilities, grading of the GMPEF Site, and establishing vegetative cover. It is assumed that D&D would be similar in duration and the numbers of workers as construction. Therefore, as described in Section 4.11.1.1.1, *Construction*, population impacts due to D&D of the GMPEF would be SMALL.

4.11.1.2 *Economic Impacts*

Combining corporate income, individual income, and individual sales tax revenue, this analysis concludes that operation of the GMPEF would generate approximately $2.8 billion in economic benefit over the 40-year operations period. Averaging approximately $71 million per year (WNN, 2025), this represents 0.5 percent of Kentucky's Fiscal Year (FY) 2024 General Fund (GLE, 2025), which would be a SMALL to MODERATE beneficial impact.

4.11.1.2.1 Construction

Construction of the GMPEF is expected to last 2 years. The annual construction labor force would be approximately 200 workers. This workforce would represent approximately 10 percent of the 1,922

construction jobs in the two-county region (Table 3-26) and is estimated to have a SMALL positive impact on the regional economy.

Because it is estimated that 20 to 40 percent of the construction workers would be hired from outside the region, building the GMPEF would directly increase the number of construction workers employed in the region. This analysis estimates that approximately 40 to 80 construction workers could move into the region from outside McCracken and Ballard Counties. This influx of workers would represent a maximum increase of 4 percent over the projected number of regional construction jobs (80 new workers divided by 1,922 baseline construction employment).

Assuming GMPEF construction workers would earn an estimated average annual salary of $80,000, the GMPEF's estimated construction payroll for the 3-year period would be $48 million. The estimated salaries of the 40 to 80 new construction workers that would move into the region to work on construction of the GMPEF would represent an increase of $3.2–6.4 million in regional income per year.

In addition, the new workers in the region would generate new State and local tax revenue. Assuming these workers claim this income on their State income tax (without utilizing any deductions or tax credits), and are taxed at current income tax rates (4.5 percent state income tax), this analysis estimates that each worker would have an average income tax payment of approximately $3,600, which would total approximately $144,000 to $288,000 of new State income tax revenue per year during construction ($3,600 multiplied by 40 to 80 workers). Total new income tax revenue for the 3-year construction period would be $432,000 to $864,000 ($144,000 to $288,000 multiplied by 3 years).

The assumed average salary for GMPEF construction workers is expected to be approximately 26.9 percent more than the $58,490 median household income in McCracken County in 2020. Similarly, the assumed average GMPEF construction worker salary would be approximately 28.6 percent higher than $57,111 median household income in Ballard County in 2020 (Section 3.10, *Socioeconomic Environment*, Table 3-27).

During the FY 2022–2023, Kentucky State government collected $5.8 billion in revenue through individual income taxes (accounting for approximately 39 percent of total State revenue) (GLE, 2025). As a result, the tax revenue generated solely by new construction workers entering the region from other parts of the country would not have a noticeable impact, as the estimated annual income tax revenues from workers moving into the region represents less the 0.005 percent of the FY 2022–2023 State income tax revenues (GLE, 2025; KYDOR, 2024)**.**

Additional tax revenue would also be directly generated by the money construction workers spend inside the region that is subject to State and local sales taxes (6 percent total, no county sales tax). Assuming that each of the 40 to 80 new construction workers earn an average salary of $80,000 and that they spend 35 percent of that income on goods and services inside the region that are subject to State and local sales taxes, this analysis estimates that State sales tax revenue would increase between $67,200 and $134,400 per year ($80,000 multiplied by 35 percent multiplied by 6 percent multiplied by 40 to 80 workers).

During the FY 2022–2023, Kentucky State government collected $5.6 billion of revenue from sales and use taxes (GLE, 2025). As a result, the annual sales tax revenue generated by construction workers entering the region from other parts of the country represents less than 0.003 percent of the FY 2022-2023 State sales tax revenues and would not be noticeable (GLE, 2025; KYDOR, 2024).

The analysis does not account for additional indirect income and sales tax revenue that could be generated as direct local spending on construction of the GMPEF causes other businesses and households to increase their spending throughout the region, creating new jobs and income. In addition, the analysis does not

estimate property tax revenues that would be paid to McCracken County as a result of construction of the GMPEF.

4.11.1.2.2 Operation

Operation of the GMPEF is expected to begin in 2028 and last 40 years until 2068. Approximately 140 workers would be engaged in operations, earning an annual payroll of $16.8 million (assuming an average salary of $120,000). This workforce would represent about 5 percent of the total number of manufacturing jobs in the two-county region (3,009) (see Table 3-27). Therefore, operation would have SMALL to MODERATE positive impacts on the regional economy.

The average salary for GMPEF workers during operations is expected to be over two times higher than the $58,490 median household income in McCracken County in 2020. Similarly, the average GMPEF operations worker salary would be over two times higher than the $57,111 median household income in Ballard County in 2020 (Section 3.10, *Socioeconomic Environment*, Table 3-27).

Because some workers would be hired from outside the region, operation of the GMPEF could impact the region's economy by increasing the number of manufacturing workers employed in the region. This analysis estimates that up to 20 percent of the operations workforce could come from outside the region. This means that approximately 28 workers in operation activities would move into the area. These 28 workers would represent a 0.9 percent increase in the region's manufacturing jobs in the year 2023 (28 workers divided by 3,009 manufacturing jobs in the two-county region).

Incomes earned by workers moving into the area are estimated to increase the region's income by approximately $3.4 million annually. This assumes the 28 new workers engaged in operations would be paid an average salary of $120,000.

In addition, new workers moving into the region would generate State and local tax revenue that would not otherwise have been collected. If each GMPEF employee files as "single" on their State income tax and does not utilize deductions or tax credits, the average individual State income tax payment would be $5,400 per employee. As a result, the individual income tax revenue created by the 28 new GMPEF employees would be approximately $151,200 per year. Total new income tax revenue for the 40-year operations period would be $6,050,000 ($151,200 multiplied by 40 years).

During the FY 2022–2023, the Kentucky State government collected $5.8 billion in revenue through individual income taxes (accounting for approximately 39 percent of total State revenue) (GLE, 2025). As a result, the tax revenue generated solely by new operation workers entering the region from other parts of the country would not have a noticeable impact on State income tax revenues as the estimated annual income tax revenue generated by workers moving into the region represents less than 0.003 percent of the FY 2022–2023 State income tax revenues (GLE, 2025; KYDOR, 2024).

The money new workers spend inside the region would also be subject to State and local sales taxes (6 percent total, no local tax). If the 28 new workers engaged in operation activities earn approximately $120,000 per year, then these workers would earn a total of $3.4 million annually. If these workers spend 35 percent of their income on goods and services that are subject to State and local sales taxes, the spending of the operation workers would generate $70,560 of annual State sales tax revenue ($120,000 multiplied by 35 percent multiplied by 6 percent multiplied by 28 workers).

During the FY 2022–2023, Kentucky collected $5.6 billion of revenue from sales and use taxes (GLE, 2025; KYDOR, 2024). As a result, the sales tax revenue generated by workers entering the region from other parts of the country for operations activities represents approximately 0.001 percent of the FY 2022–2023 State sales tax revenues and would not be noticeable.

When the GMPEF is fully operational it would employ approximately 140 workers. Assuming an average salary of approximately $120,000, annual income tax contributions would be approximately $756,000 per year ($5,400 per employee multiplied by 140 employees) and annual sales tax contributions approximately $352,800 per year ($120,000 multiplied by 35 percent multiplied by 6 percent multiplied by 140 employees). These revenues would be collected for 40 years until GMPEF production ends in 2068, resulting in cumulative income tax collections of approximately $30.2 million and sales tax collections of approximately $14.1 million.

The analysis does not account for additional income and sales tax revenue that could be generated as the economic impact of operating the GMPEF "ripples" throughout the regional economies, creating new jobs and income. These impacts were excluded from the analysis due to a lack of reliable data on the future economic structure of the region.

Finally, operation of the GMPEF would create corporate income tax revenue for the State of Kentucky that would not be generated if the GMPEF were not operating. Based on estimated from GeM internal business confidential economic models using predictive inflation rates and market trends, Kentucky corporate income taxes are estimated to total approximately $2.2 billion over the operating life of the GMPEF. This number has a degree of variability due to tax credits, operations losses, and depreciation schedules.

4.11.1.2.3 Decontamination and Decommissioning

As described in Section 2.1.2.1.3, *Decontamination and Decommissioning*, D&D of the GMPEF would involve the removal of all structures, roads and utilities, grading of the GMPEF Site, and establishing vegetative cover. It is assumed that D&D would be similar in duration and the numbers of workers as construction. Therefore, as described in Section 4.11.1.2.1, *Construction*, economic impacts due to D&D of the GMPEF would be SMALL

4.11.1.3 *Social Impacts*

4.11.1.3.1 Construction

The impact of constructing the GMPEF on social resources and services would depend on how many workers are hired from outside the region. Similar to population impacts, if all construction workers are obtained from within the region, then social services such as law enforcement and education would experience no increase in demand and, therefore, suffer no adverse impacts. On the other hand, a large influx of new residents could potentially affect the community's ability to provide the same level of services that it currently provides.

This analysis examines the impact that constructing the GMPEF would have on housing, educational services, medical services, law enforcement, and fire and rescue services (impacts on transportation resources are discussed in Section 4.3, *Transportation Impacts*). Overall, because the number of workers coming to the region is expected to be relatively small, social impacts of construction of the GMPEF on the region are expected to be SMALL.

4.11.1.3.1.1 Housing Impacts

The introduction of construction workers from outside the region would place new demands on available housing. As described in Section 4.11.1.1, *Population Impacts*, it is estimated that 40–80 workers would come to the area from outside the region. If each of these workers represents a single household, this would account for 3 to 5 percent of the 1,495 housing units for sale or rent in the region (excluding units for seasonal or recreational use) (see Table 3-30).

However, it is likely that most households would concentrate in McCracken County for two reasons: first, the vast majority of housing units for sale or rent are located there (1,345), and second, the GMPEF is

located in that county. In the unlikely event that all new workers and their families settled in McCracken County, this would still only represent, at most, 6 percent of all available housing units. Considering these results, this analysis concludes that the temporary increase in housing demand during the 2 years of construction would not place noticeable stress on available housing.

4.11.1.3.1.2 Educational Service Impacts

The introduction of new construction workers and their families to the region would place new demands on the region's educational services. As described In Section 4.11.1.1, *Population Impacts*, NRC data and experience with nuclear facility related construction projects indicate that approximately 65 percent of individuals who move into a region for construction jobs bring their families, which consist, on average, of the worker, a spouse, and one school-aged child (GLE, 2025; NRC, 1994). Therefore, construction are estimated to increase the population level by up to 52 school-age children (80 workers, multiplied by 65 percent). Assuming these children were spread across grades K–12, this would represent a 0.5 percent increase in total region enrollment (11,696 students) (see Table 3--344).

However, as discussed in the previous section, the vast majority of families would probably locate in McCracken County due to the proximity to the GMPEF and the greater availability of vacant housing. But even if all 52 school-age children attended McCracken County schools, this would still only result in an increase in McCracken County school enrollment (10,436) of at most 0.5 percent. This small projected increase in total region enrollment is not expected to have an adverse impact on educational services in the region as a whole or in McCracken County in particular.

4.11.1.3.1.3 Medical Services Impacts

To accurately reflect how the population influx during construction would affect the existing medical services infrastructure, this analysis considered several different measures. First, the number of healthcare workers that would be required to serve new individuals entering the region was measured. The populations in each county per health care personnel in 2023 are reported in Table 3-39. According to these data, McCracken County has substantially more healthcare resources than Ballard County—937 people per primary care physician, 492 people per registered nurse, and 1,454 people per dentist. In 2020, there were 67,875 people living in McCracken County (see Table 4-8). This implies that there were 72 physicians, 137 registered nurses, and 46 dentists in McCracken County in 2020. This analysis used health resource ratios for McCracken County as the reference case to provide "upper-bound" estimates of the number of doctors that would be required during construction.

Table 4-8: Regional Population Projections (2020–2050)

Year	McCracken County	Ballard County	Total
2020	67,875	7,728	75,603
2025	66,781	8,167	74,948
2030	66,567	8,073	74,640
2035	65,958	7,935	73,893
2040	65,105	7,770	72,875
2045	64,214	7,607	71,821
2050	63,428	7,459	70,887

Sources: (U.S. Census Bureau, 2020b; KSDC, 2022)

As described in Section 4.11.1.1, *Population Impacts*, construction of the GMPEF is expected to introduce approximately 92 to 184 new individuals to the region. The health-resource ratios for McCracken County indicate that less than one primary care physician, less than one registered nurse, and less than one dentist would be required to provide construction workers and their families with the same level of

medical services that the region's current residents receive. This amounts to less than a 1 percent increase in the total number of physicians, nurses, and dentists in McCracken County in 2020.

A second measure considered by this analysis was the number of hospital beds that are empty at the end of an average day. This metric could potentially be considered a measure of the "excess capacity" in county hospitals. The closest hospital to the GMPEF is the Mercy Health–Lourdes Hospital. This medical facility has 286 licensed beds, 112 of which were being used each day on average in 2023. These data imply that, on an average day, Mercy Health–Lourdes Hospital has 174 beds not being used.

Considering that the hospital-use rate in Kentucky was 11 individuals per 1,000 in 2022, it is expected that approximately 1 to 2 of the 92 to 184 new individuals attracted to the region by construction activities would be hospitalized each year (GLE, 2025; Kaiser Family Foundation, 2022). As a result, it is apparent that a single hospital is equipped to handle the entire population influx during GMPEF construction.

A final measure of how medical services could be impacted during construction is the potential percentage change in baseline admissions. In 2023, Mercy Health–Lourdes Hospital admitted 9,029 individuals. If the influx of population during construction results in one to two new annual hospitalizations, this would not result in a noticeable change in baseline admissions. Based on this analysis, it appears that the population increase associated with construction of the GMPEF would not have a measurable impact on medical services and would have SMALL impacts.

4.11.1.3.1.4 Law Enforcement Impacts

How the population increase accompanying the construction of the GMPEF impacts law enforcement resources would depend on how that population is distributed. As discussed in previous sections, it is likely that the vast majority of workers and their families would be located in McCracken County, which is primarily policed by the McCracken County Sheriff's Office (serving the county's 249 square miles). This agency provided law enforcement services to 67,428 people living in unincorporated portions of McCracken County in 2023 (GLE, 2025).

In the unlikely event that all 92 to 184 people introduced to the region during construction of the GMPEF settled in the communities of unincorporated McCracken County, the expected increase in the population served would be approximately 0.2 percent during construction. The impacts on the Sheriff's Office (as well as other law enforcement agencies) would likely be even smaller because (1) the population would be spread across McCracken and Ballard Counties and (2) more resources would be devoted to law enforcement in the future to accommodate population increases. As a result, construction of the proposed GMPEF is not expected to adversely affect law enforcement agencies in the region.

4.11.1.3.1.5 Fire and Rescue Service Impact

By introducing new households to the region, the construction of the GMPEF could potentially impact the ability of fire and rescue departments to deliver the same level of services. In Section 4.11.1.1, *Population Impacts*, it was demonstrated that construction would introduce 92 to 184 individuals, which would result in a 0.2 percent increase in the region's projected 2025 population. If all of these individuals located themselves in McCracken County, this would still only result in a 0.2 percent population increase. This suggests that current fire and rescue departments would not face a significant increase in the population they serve.

4.11.1.3.2 Operation

By introducing new people to the region, operation of the GMPEF could also affect housing, educational, medical, law enforcement, and fire services (impacts on transportation resources are discussed in Section 4.3, *Transportation Impacts*). Overall, because the number of workers coming to the region is

expected to be relatively small, the social impact of operation of the GMPEF on the region are expected to be SMALL.

4.11.1.3.2.1 Housing Impact

Approximately 140 workers would be required for operational activities. This analysis assumes that approximately 20 percent of these workers (28) would come from outside the region. Assuming each new worker represents a single household, this would represent approximately 2 percent of the 1,495 housing units for sale or rent in 2020 (see Table 3-31). However, as during construction, it is likely that the majority of these households would concentrate in McCracken County due to both the location of the GMPEF in that county, as well as the greater availability of housing. If all 28 households locate in McCracken County, this would represent approximately 2 percent of the 1,345 housing units for sale or rent in that county.

Given that demand for housing during GMPEF operation represents a small fraction of the available housing stock and may represent an even smaller fraction in the future as the housing stock grows, this analysis concludes that operation of the GMPEF would have a SMALL impact on the availability of housing in the region.

4.11.1.3.2.2 Educational Service Impact

As discussed above, approximately 140 workers would be required for operational activities. Assuming 20 percent of this work force comes from outside the region, and 65 percent of the 28 new workers needed during operations would have one school-age child, this corresponds to a total of 19 new students being introduced to the region. Assuming these children were spread across grades K–12, total region enrollment (11,696 students) would increase 0.2 percent (see Table 3-35). However, as previously discussed, it is likely that a majority of students may be concentrated in McCracken County. Even if all 19 children attended schools in McCracken County, this would represent a 0.2 percent increase over the county's K–12 enrollment of 10,436 students.

Considering that the number of new students is small relative to total enrollment, this analysis concludes that the school systems would be able to accommodate the increased school enrollment associated with the GMPEF's operation and any impacts would be SMALL.

4.11.1.3.2.3 Medical Service Impact

As with construction, this analysis used several different measures to assess the impact that operating the GMPEF would have on the availability of medical services in the region. As discussed previously, McCracken County (population 66,567) has 937 people per primary care physician, 492 people per registered nurse, and 454 people per dentist (GLE, 2025).

As described under Section 4.11.1.1, *Population Impacts*, during operations, workers and their families coming to the region would increase the population by no more than 64. The health care ratios imply that less than one primary care physician, one registered nurse, and one dentist would be required to provide workers and their families with the same level of medical services that current region residents receive. This would also represent less than a 1 percent increase in the total number of health care personnel in McCracken County.

A second measure to consider is the number of hospital beds that are empty at the end of an average day, which could be considered a measure of the "excess capacity" of county hospitals. The closest hospital to the GMPEF is the Mercy Health–Lourdes Hospital. This medical facility has 286 licensed beds, 112 of which were being used each day on average in 2023. These statistics indicate that Mercy Health–Lourdes Hospital has 174 unoccupied beds on an average day.

Considering that the hospital-use rate in Kentucky was 11 individuals per 1,000 in 2022, it is expected that approximately 1 to 2 of the up to 64 new individuals attracted to the region by operations activities would be hospitalized each year (GLE, 2025; Kaiser Family Foundation, 2022). As a result, it is apparent that a single hospital is equipped to handle the entire influx of population during GMPEF operation.

A final measure of how medical services could be impacted during operation is the potential percent change in baseline admissions. In 2020, Mercy Health–Lourdes Hospital admitted 9,029 individuals. In 2022, the occupancy rate in McCracken County was 36.9 percent. As a result, the increase in regional population would result in an estimated one to two new hospitalizations per year, which is not a noticeable change in baseline admissions. Therefore, it appears that the hospitals in McCracken County could be expected to handle the hospitalization services of the entire GMPEF operation-related population, and the combined services of all the existing hospitals in the region would be even better able to provide these services.

Since the new individuals introduced to the region during operation of the GMPEF would not require a large number of medical personnel and would not result in a significant number of hospitalizations compared to baselines (which likely underestimate the availability of health resources in the future), this analysis concludes that operation of the GMPEF would not significantly stress the region's existing medical services and would have SMALL impacts.

4.11.1.3.2.4 Law Enforcement Impacts

As discussed in previous sections, up to 64 new individuals are expected to come to the region during operation of the GMPEF. This analysis assumes it is likely that the majority of workers and their families would locate in McCracken County. This county is primarily served by the McCracken County Sheriff's Office, which polices the entire county. This agency provided law enforcement services to 67,428 people living in unincorporated portions of McCracken County in 2023 (GLE, 2025). In the unlikely event that all people coming to the region during operation were to settle in unincorporated McCracken County, it is not expected that an increase in the population served would be more than 0.1 percent.

The impacts on the McCracken County Sheriff's Office (as well as other law enforcement agencies) would likely be even smaller than this measure suggests due to the fact that the population would at least be partially spread across McCracken and Ballard Counties. Based on this information, this analysis concludes that operation of the GMPEF would not be expected to adversely affect law enforcement agencies in the region and therefore would have SMALL impacts.

The GMPEF would be subject to NRC physical security requirements under 10 CFR Part 73, which require the licensee to maintain an NRC-approved security plan and an onsite, armed protective force capable of responding to security-related contingencies without initial reliance on offsite law enforcement. The security plan would also establish a formal Local Law Enforcement Agency (LLEA) agreement with the McCracken County Sheriff's Office and/or Kentucky State Police, defining communication protocols, response roles, and coordination procedures for contingencies that exceed the onsite protective force's capability. Because the GMPEF's onsite security force would serve as the first line of response for security events, and because the LLEA agreement would establish pre-coordinated backup arrangements, day-to-day demand on local law enforcement resources for facility-related emergencies is expected to be minimal. Based on this information, this analysis concludes that emergency response coordination for the GMPEF would not be expected to adversely affect LLEAs. Additionally, this analysis concludes that operation of the GMPEF would not be expected to adversely affect law enforcement agencies in the region and therefore would have SMALL impacts.

4.11.1.3.2.5 Fire and Rescue Service Impacts

The influx of workers and their families during operations could potentially impact the ability of fire and rescue departments to deliver the same level of services. In Section 4.11.1.1, *Population Impacts*, it was demonstrated that no more than 64 individuals would be added to the population in this region. If all of these individuals located themselves in McCracken County, this would still only result in a 0.1 percent population increase (64 new individuals divided by 66,567 McCracken County population in 2030). This suggests that current fire and rescue departments would not face a significantly large increase over the population they are already expected to serve and therefore the impacts would be SMALL.

The GMPEF would be required to maintain an NRC-approved Emergency Plan under 10 CFR Part 70, including onsite fire protection systems, trained emergency response personnel, and pre-arranged mutual aid agreements with local fire and rescue departments to supplement onsite capability in the event of a fire, industrial accident, or radiological emergency. Consistent with practice at comparable fuel-cycle facilities, GeM would be expected to provide specialized radiological safety training, protective equipment, and technical guidance to local fire and rescue personnel who may respond to the site, ensuring responders are adequately prepared without requiring local departments to independently develop or fund radiological response capability. Because the facility's onsite emergency response resources and coordinated mutual aid arrangements would substantially limit the scope of any additional demand on local departments, and because facility-related emergency responses are expected to be infrequent, this analysis concludes that the GMPEF would have SMALL impacts on local fire and rescue services.

4.11.1.3.3 Decontamination and Decommissioning

As described in Section 2.1.2.1.3, *Decontamination and Decommissioning*, D&D of the GMPEF would involve the removal of all structures, roads and utilities, grading of the GMPEF Site, and establishing vegetative cover. It is assumed that D&D would be similar in duration and the numbers of workers as construction. Therefore, as described in Section 4.11.1.3.1**,** *Construction*, social impacts due to D&D of the GMPEF would be SMALL.

4.11.2 Cumulative Socioeconomic Impacts

While employment and social impacts are not additive across the assumed 47-year project life, comprising comconstruction (2 years), operation (40 years), and decommissioning (5 years), other impacts such as tax receipts can be added over time to estimate cumulative beneficial impacts of the GMPEF.

As described above, impacts from construction, operation, and D&D of the GMPEF would be SMALL. In migration of new employees and their families to the region would increase the local population by no more than approximately 0.25 percent and would not substantially contribute to adverse cumulative socioeconomic impacts. Therefore, because the GMPEF would not substantially contribute to adverse cumulative impacts, cumulative socioeconomic impacts need not be evaluated further.

4.11.3 Control of Impacts

Because socioeconomic impacts would be expected to be SMALL, no mitigation measures are anticipated to be necessary. GeM could incorporate measures to further reduce socioeconomic impacts. These measures could include, for example, reducing the number of workers moving to the region by hiring more employees from the local workforce. See Chapter 5.0, *Mitigation Measures*, for more information.

4.12 Public and Occupational Health Impacts

(Trade Secret / Confidential Commercial Information)

[redacted]

(Trade Secret / Confidential Commercial Information)

[redacted]

(Trade Secret / Confidential Commercial Information) [redacted]

[redacted]

[redacted]

4.12.1 Nonradiological Impacts

4.12.1.1 *Nonradiological Pathway Assessment*

Figure 4-1 illustrates the boundaries of the GMPEF and PLEF Sites and the locations of the potential receptors of interest; receptors of interest include full-time residents and sensitive receptors (e.g., schools), as described in this paragraph. The full-time resident located nearest to the PLEF is approximately 0.75 miles (1.2 kilometers) south of the Site. Three schools are located within a 5-mile (8-kilometer) radius (Heath Elementary School, Heath Middle School, and McCracken County High School) as shown on Figure 4-1. Two hospitals serve the greater Paducah area and are located east and southeast of the GMPEF (CCU Western Baptist Hospital, 10.6 miles [17.1 kilometers] east and Mercy Health–Lourdes Hospital, 9.9 miles [15.9 kilometers] southeast). The City of Metropolis, Illinois, has one hospital (Massac Memorial Hospital) and is approximately 6.6 miles [10.6 kilometers] northeast of the GMPEF Site. There are no public drinking water intakes on surface waterbodies within 5 miles (8 kilometers) of the GMPEF.

Following the commissioning of the GMPEF, any new projects would have to be approved by the Industrial Hygiene and Safety manager to ensure that appropriate industrial safety measures are implemented. Work environments that present the potential for exposure to chemical, biological, or physical agents would be evaluated, and appropriate safety controls implemented to ensure safety equipment is assigned to workers if applicable. The OSHA Industrial Hygiene and Safety Program would be evaluated on an annual basis.

4.12.1.2 *Nonradiological Public and Occupational Exposure Impacts*

Sources of nonradiological exposure to the public and to facility workers are characterized below. Nonradiological effluents have been evaluated and are not expected to exceed criteria in 40 CFR Parts 50, 59, 60, 61, 122, 129, or 141. Radionuclides, HF, and methylene chloride are governed under the National Emission Standards Hazardous Air Pollutants (EPA, 2003).

The GMPEF would operate a proprietary, non-combustion, closed-system process inside the main GMPEF enrichment buildings. No gaseous criteria air pollutants (e.g., carbon monoxide, NO_x, sulfur dioxide, volatile organic compounds) would be produced by this process. Any regulated nonradiological gaseous emissions would be below Kentucky Department of Air Quality (KDAQ) permit limits, and the Proposed Action would not significantly impact air quality or increase potential exposures to gaseous emissions (See Section 4.7, *Air Quality Impacts*). For airborne releases, offsite concentrations from normal operations of the GMPEF are expected to be too low to present problems to public health through inhalation, ingestion, or dermal exposure pathways.

Worker exposure to in-facility gaseous emissions would not exceed OSHA's occupational safety and health standards for toxic and hazardous substances, in accordance with 29 CFR Part 1910, Subpart Z (Toxic and Hazardous Substances [Federal OSHA Regulations for General Industry]). Laboratory and maintenance activities involving hazardous fumes would be conducted with ventilation control (e.g., fume hoods) and/or with the use of respiratory protection as required by the Industrial Hygiene Safety Program.

Some intermittent gaseous releases may occur inside the GMPEF enrichment buildings due to the connecting and disconnecting of the UF_6 cylinders on the front end and back end of the operations and process equipment and repair activities. These releases would contain UF_6 gas, which releases HF when it dissociates. HF emissions are regulated by the KDAQ as a HAP. A building ventilation system would maintain the majority of the interior of the process buildings under sub-atmospheric pressure. This would prevent air emission releases that occur inside the process buildings from being directly vented outside the building. Controls on the process are designed to isolate the leak and shut down the process to prevent damage to the equipment. Exhaust gases from the emission control system would be vented to the atmosphere through rooftop stacks. The design control efficiency for the emission control system is expected to be at least 99 percent (by weight) removal for fluoride.

The primary nonradiological hazardous air effluent associated with the GMPEF would be HF. The use of air emission control systems and the implementation of mitigation measures would reduce the levels of air emissions released to the atmosphere. Fluoride monitors on the vent stacks would be employed to detect incidental releases. To measure fluoride releases to the atmosphere, an in-stack filter would be analyzed for fluoride content. An air quality permit from the KDAQ would be required for the operation of the GMPEF. Total fluoride emissions are expected to be well below permitted levels, which would be protective of human health. No adverse health impacts to nearby residents are expected.

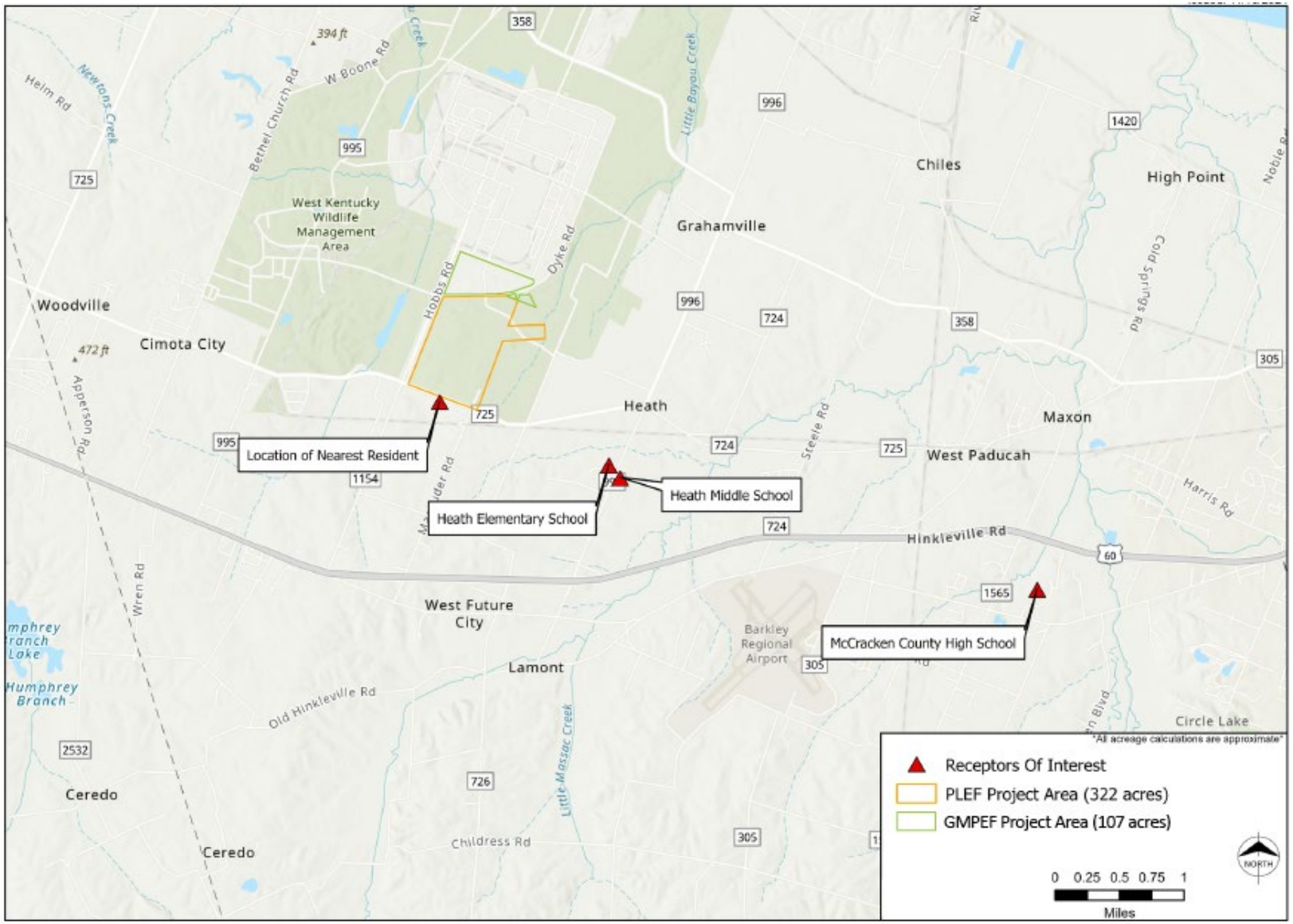


Figure 4-1: PLEF and GMPEF Sites and Receptors of Interest

4.12.1.2.1 Routine Gaseous Effluent

Of primary importance to the GMPEF is the control of UF_6. UF_6 is hygroscopic (moisture absorbing) and, in contact with water, will chemically break down into uranyl fluoride (UO_2F_2) and HF. When released to the atmosphere, gaseous UF_6 combines with humidity to form a cloud of particulate UO_2F_2 and HF fumes. Inhalation of UF_6 typically results in internal exposure to UO_2F_2 and HF. In addition to a potential radiation dose, a worker would be subjected to two other primary toxic effects: (1) the uranium in the uranyl complex acts as a heavy metal poison that can affect the kidneys, and (2) the HF can cause severe irritation to the skin and lungs at high concentrations. Of these, HF is the most significant hazard, being toxic to humans.

[redacted] (Trade Secret / Confidential Commercial Information)

Worker exposure to in-plant gaseous effluents will be minimal. No exposures exceeding 29 CFR Part 1910, Subpart Z are anticipated. Leaks in UF_6 components and piping would cause air to leak into the system and would not release effluent. All maintenance activities utilize mitigative fixtures including local flexible exhaust hoses connected to the Gaseous Effluent Ventilation System, thereby minimizing any potential for occupational exposure. Laboratory and maintenance operations activities involving hazardous gaseous or respirable effluents will be conducted with ventilation control (i.e., fume hoods, local exhaust or similar) and/or with the use of respiratory protection as required.

4.12.1.2.2 Routine Liquid Effluent

Under the Proposed Action, potentially radiologically contaminated process wastewater would be collected for monitoring before being shipped off site for treatment and disposal by licensed and regulated vendors. Sanitary wastewater (e.g., originating from washrooms) from the GMPEF would be conveyed to the DOE sanitary sewer for treatment at the C-615 Sewage Treatment Plant and discharge through an approved KPDES outfall. With the addition of the Proposed Action, wastewater quantity and quality would remain within KPDES-permitted levels, and therefore, environmental impacts associated with these treated wastewater effluents are anticipated to be SMALL.

[redacted] (Trade Secret / Confidential Commercial Information). No exposures exceeding 29 CFR 1910, Subpart Z are anticipated. Additionally, handling of all chemicals and wastes will be conducted in accordance with the site Environment, Health, and Safety Program, which will conform to 29 CFR 1910 and specify the use of appropriate engineered controls, as well as personnel protective equipment, to minimize potential chemical exposures.

[redacted] (Trade Secret / Confidential Commercial Information).

Table 4-9: [redacted] (Trade Secret / Confidential Commercial Information)

[redacted]

Source: [redacted] (Trade Secret / Confidential Commercial Information)

4.12.2 Radiological Impacts

This section describes public and occupational health impacts from radiological exposure. For the purposes of this analysis, members of the public are assumed to be those persons outside the GMPEF boundary for which the GMPEF does not control. This includes staff and visitors to the PLEF and PGDP Sites as well as nearby visitors.

4.12.2.1 *Radiological Source with Exposure Potential*

Workers at the GMPEF are subject to higher potential exposures than members of the public because they are involved directly with handling uranium containers, processes for the enrichment of uranium, and decontamination and maintenance of equipment. During routine operations, workers at the plant may potentially be exposed to radiation from uranium via inhalation of airborne particles and direct exposure to equipment and components containing uranic materials. The radiation protection program at the GMPEF requires routine radiation surveys and air sampling to assure that worker exposures are maintained ALARA. In addition, exposure-monitoring techniques at the plant include use of personal dosimeters, personnel breathing zone air sampling, and annual whole-body counting.

In addition to the radiological hazards associated with uranium, as discussed above, workers may be potentially exposed to the chemical hazards associated with uranium. The material, UF_6, is hygroscopic (moisture absorbing) and, in contact with water, will chemically break down into UO_2F_2 and HF. When released to the atmosphere, gaseous uranium hexafluoride combines with humidity to form a cloud of

particulate UO_2F_2 and HF fumes. The reaction is very fast and is dependent on the availability of water vapor. Consequently, inhalation to UF_6 is typically an internal exposure to HF and UO_2F_2. In addition to the radiation dose, a worker would be subjected to two other primary toxic effects: (1) the uranium in the uranyl complex acts as a heavy metal poison that can affect the kidneys, and (2) the HF can cause acid burns to the skin and lungs if concentrated. Because of low specific activity values, the radiotoxicity of UF_6 and its products are smaller than their chemical toxicity.

Both a radiation protection program and an industrial safety program will protect workers at the GMPEF. The Radiation Protection Program will comply with all applicable NRC requirements established in 10 CFR Part 20, Subpart B. Similarly, the Health and Safety Program at the GMPEF will comply with all applicable OSHA requirements established in 29 CFR Part 1910.

The general public and the environment may be impacted by radiation and radioactive material from the GMPEF in two primary ways. Potential radiological impacts may occur from (1) gaseous and liquid effluent discharges associated with controlled releases from the uranium enrichment process lines during routine operations and from decontamination and maintenance of equipment, and (2) direct radiation exposure associated with transportation and storage of UF_6 feed cylinders and product cylinders.

The potential radiological impacts to the public from operations at the GMPEF are those associated with chronic exposure to low levels of radiation, not the immediate health effects associated with acute radiation exposure. The major sources of potential radiation exposure are the effluent from the process buildings and direct radiation from the cylinder storage yards.

[redacted] (Trade Secret / Confidential Commercial Information). Due to the anticipated low volume of contaminated liquid waste and the effectiveness of treatment processes, liquid effluent discharges are not expected to have a significant radiological impact on the public or the environment. In addition, the radiological impacts associated with direct radiation from indoor operations are not expected to be a significant contributor because the low-energy gamma-rays associated with the uranium will be absorbed almost completely by the process lines, equipment, cylinders, and building structures. However, the cylinder storage yards may present the highest potential for direct radiation impact to the public at or beyond the plant fence line. The combined potential radiological impacts associated with the small quantity of uranium in effluent discharges and direct radiation exposure due to uranium storage containers are expected to be a small fraction of the general public dose limits established in 10 CFR Part 20 and within the uranium fuel cycle standards established in 40 CFR Part 190.

The enrichment process system operates sub-atmospherically such that any air leaks are into the equipment and not into the building environment. In addition to building HVAC, the plant design includes two separate Gaseous Effluent Ventilation Systems for treatment of potentially contaminated gas streams. The process in the main enrichment buildings includes exhaust filters (pre-filters, HEPA filters, and activated carbon filters) before gaseous effluent is discharged to the environment. In addition, gaseous effluent from the GEVS is monitored continuously (refer to Section 6.1, *Radiological Monitoring*, for details regarding the effluent monitoring system).

Airborne filtration systems would exhaust above the roof of the process buildings. Airborne concentrations of uranium present in gaseous effluent continually decrease with distance from the release point. Therefore, the greatest offsite radiological impact is expected at or near the site boundary. The radiological impacts on members of the public and the environment at offsite potential receptor locations are expected to be only small fractions of the radiological impacts that have been estimated for

the site boundary locations because of the low initial concentrations in gaseous effluent and the high degree of dispersion that takes place as the gaseous effluent is transported.

4.12.2.2 *Radiological Pathway Assessment*

4.12.2.2.1 Routine Gaseous Effluent Dose Pathway

Most of the airborne uranium is removed through filtration prior to the discharge of gaseous effluent to the atmosphere. However, the release of uranium in extremely low concentrations is expected and raises the potential for radiological impacts to the general public and the environment.



(Trade Secret / Confidential Commercial Information).

There are three primary exposure pathways associated with gaseous plant effluent: (1) direct radiation due to deposited radioactivity on the ground surface (ground plane exposure), (2) inhalation of airborne radioactivity in a passing effluent plume, and (3) ingestion of food that was contaminated by plant effluent radioactivity. Of these three exposure pathways, inhalation exposures are expected to be the predominant pathways at site boundary locations and also at offsite locations that are relatively close to the site boundary. The reason for this is that the discharge point for gaseous effluent, roof-top stacks, result in ground level effluent plumes. For ground level plume, the airborne concentration(s) within the plume decrease with the distance from the discharge point. Consequently, for gaseous effluent, the highest offsite airborne concentrations (and, hence, the greatest radiological impacts) are expected at locations close to the site boundary. Beyond those locations, the concentrations of airborne radioactive material decrease continually as it is transported because of dispersion and depletion processes. Although radiological impacts via the ingestion exposure pathways come into play for distances beyond the site boundary, the concentrations of radioactive material will have been greatly reduced by the time effluent plumes reach those locations.

4.12.2.2.2 Routine Liquid Effluent Dose Pathway

The facility does not directly discharge any industrial effluents to natural surface waters or grounds on site. All potential radiological effluents are contained on the site via collection tanks. No public impacts are expected from routine liquid effluent discharge. Since there are no planned releases to receiving

waters, impacts on human health to nearby residents or onsite workers from these effluents or from the receiving waters are anticipated to be SMALL.

As a point of comparison, the DOE Paducah Site evaluated dose to the public from a drinking water pathway and determined that no radionuclides above background level were detected and therefore estimated a dose of 0 mrem/year (DOE, 2023). Additionally, the estimated dose due to incidental ingestion of surface water for the maximally exposed individual (MEI) was estimated to be 4.1×10^{-2} mrem/year (DOE, 2023). This further supports the conclusion that impacts to the public due to the liquid discharge dose pathway is anticipated to be SMALL for the GMPEF.

4.12.2.2.3 Sediment Dose Pathway

Exposure to contaminated sediment in Bayou Creek and Little Bayou Creek could occur during hunting and other recreational activities by incidentally ingesting the sediment. For the Paducah Site, the potential dose to the most exposed individual due to incidental ingestion of sediment was estimated to be 0.03 mrem/year (DOE, 2023). Accordingly, any impacts on human health to nearby residents or onsite workers from the sediment pathway is anticipated to be SMALL for the GMPEF.

4.12.2.2.4 Direct Radiation Impacts

External radiation exposure from GMPEF operations could contribute to the overall dose to the public through a direct radiation pathway or external radiation exposure. External radiation exposure is defined as exposure attributed to radioactive sources outside of the body, such as cosmic radiation. Sources of external radiation at the GMPEF include cylinder storage pads, operations inside the GMPEF enrichment modules, and small items such as instrument calibration sources.

Storage of uranium containers may have an impact due to direct and scatter (skyshine) radiation at the site boundary, and to lesser extents, at offsite locations. The cylinder Storage yards are the most significant portion of the total direct dose equivalent. The regulatory dose limit to a member of the public in offsite areas is 0.25 millisievert [mSv] (25 mrem) per year (including the contribution from the cylinder storage yard) as defined in 40 CFR Part 190, *Environmental Radiation Protection Standards for Nuclear Power Operations*.

4.12.2.3 *Radiological Public and Occupational Exposure Impacts*

4.12.2.3.1 Direct Radiation Dose

Direct radiation doses to workers and the nearby public may occur from activities at the GMPEF as well as from ongoing activities including handling and storage of cylinders at the DOE Paducah Site and at the proposed PLEF.

4.12.2.3.1.1 Direct Doses from the GMPEF

[redacted] (Trade Secret / Confidential Commercial Information)

[redacted] (Trade Secret / Confidential Commercial Information)

Table 4-10: [redacted] (Trade Secret / Confidential Commercial Information)

Location	Annual Occupancy (hours/year)	[redacted] mSv/year (mrem/year)	[redacted] mSv/year (mrem/year)	Total mSv/year (mrem/year)
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Source: [redacted]
Key: [redacted]
Notes:
[redacted]

4.12.2.3.1.2 Direct Doses from DOE Paducah Site Cylinder Storage and Handling Activities

Consistent with DOE's Annual Site Environmental Report for the Paducah Site (DOE, 2023), the largest single contributor to overall dose to the public is via this direct dose radiation pathway.

4.12.2.3.1.3 Direct Doses from PLEF Cylinder Storage and Handling Activities

To address direct radiation dose to the public, a calculation (GLE, 2025) was performed and considered two potential scenarios: (1) an individual member of the public located just beyond the plant boundary; and (2) a continually present member of the public. This latter scenario was considered specifically to comply with Title 902 of the KAR, which requires consideration of a member of the public that is continually present in an unrestricted area.

This direct radiation pathway resulted in dose contributions to an individual member of the public located just beyond the plant boundary of 18.33 mrem/year, and a dose contribution to a continually present member of the public of 16.13 mrem/year, as shown in Table 4-11.

Table 4-11: Direct Radiation Dose Estimate for the PLEF

Scenario	Dose (mrem/year)
Individual located just beyond plant boundary	18.33
Continually present member of public	16.13

Source: GLE (2025)
Key: mrem = millirem(s); PLEF = Paducah Laser Enrichment Facility

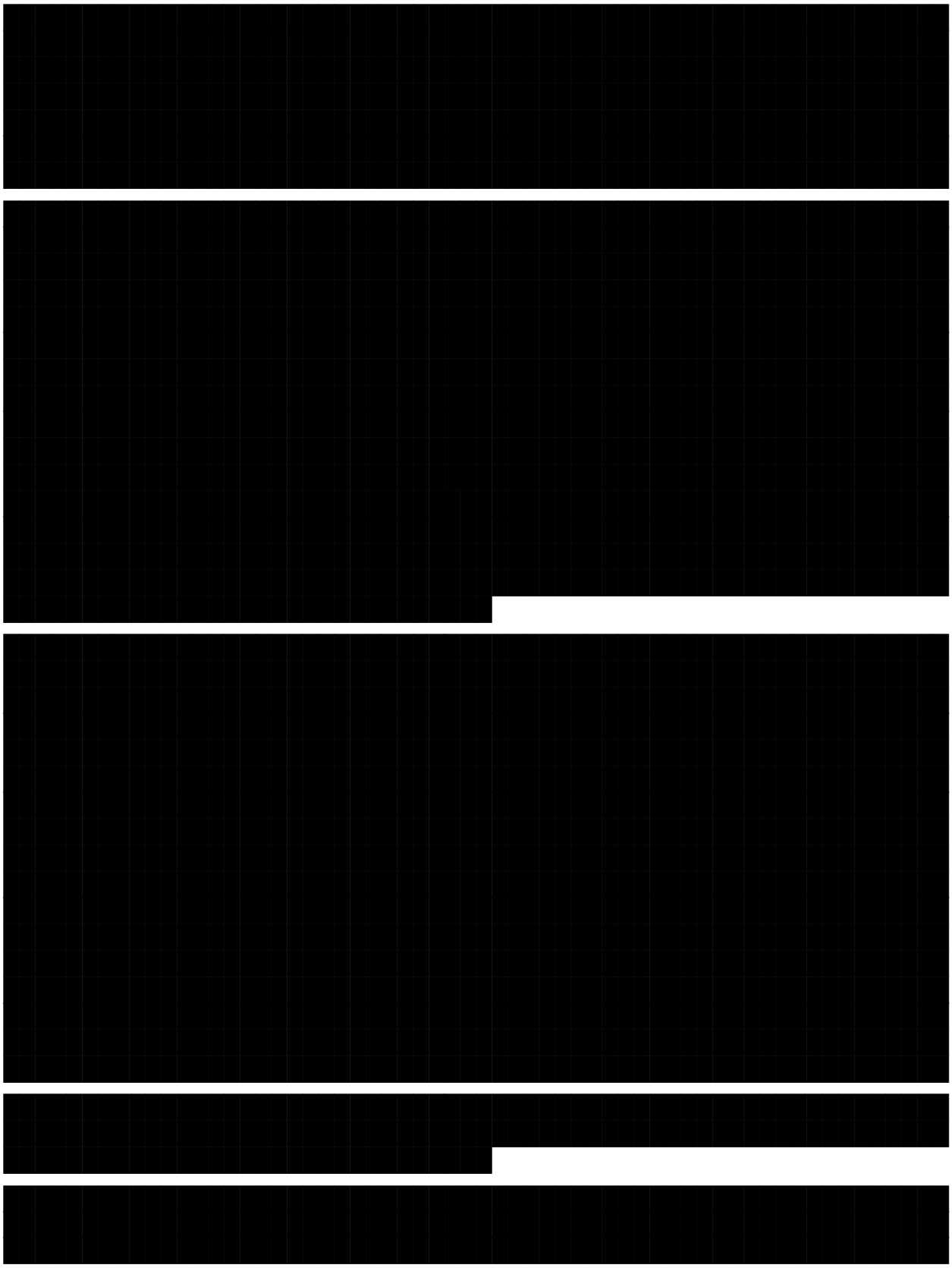
4.12.2.3.2 Gaseous and Liquid Dose Impacts

The assessment of the dose impacts resulting from the annual liquid and gaseous effluents for the GMPEF Site indicate that the principal radionuclides with respect to the dose equivalent contribution to individuals are U-234 and U-238. Each of these nuclides contributes about the same level of committed dose. The critical organ for all receptor locations was found to be the lung as a result of this pathway. This committed dose equivalent dominated all other exposure pathways by a few orders of magnitude.

(Trade Secret / Confidential Commercial Information)

[redacted]

[redacted]



[redacted]

[redacted]

(Trade Secret/Confidential Commercial Information). Similarly the actual doses to the public would also be LOW. Public doses from cylinder storage and handling operations can be shielded if the exposures might be a concern. Therefore, public and occupational health impacts are expected to be within all regulatory limits and are expected to be SMALL.

Table 4-12: [redacted] (Trade Secret / Confidential Commercial Information)

Category	Dose Equivalent	Location
Maximum Effective Dose Equivalent	[redacted]	[redacted]
Maximum Thyroid Committed Dose Equivalent	[redacted]	
Maximum Organ Committed Dose Equivalent	[redacted]	[redacted]

Source: [redacted]
Key: [redacted]

Table 4-13: [redacted] (Trade Secret / Confidential Commercial Information)

Location	Gas and Liquid Fixed Sources Effluents			TEDE
[redacted]	(mSv) (mrem)	[redacted]	[redacted]	[redacted]
[redacted]	(mSv) (mrem)	[redacted]	[redacted]	[redacted]
[redacted]	(mSv) (mrem)	[redacted]	[redacted]	[redacted]

Source: [redacted]
Key: [redacted]

Table 4-14: [redacted] (Trade Secret / Confidential Commercial Information)

Area or Component	Dose Rate, mSv/hour (mrem/hour)
[redacted]	[redacted]

Source: [redacted]
Key: [redacted]

Table 4-15: [redacted] (Trade Secret / Confidential Commercial Information)

Position	Annual Dose Equivalent [a]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]

Source: [redacted]
Key: [redacted]
Note:
[redacted]

4.12.3 Environmental Effects of Accidents

GeM considered potential accidents associated with uranium enrichment facilities, along with handling and storage facilities for uranium cylinders, that are well known and have been documented and reviewed by the NRC and DOE many times. The potential accidents considered in this chapter are consistent with the accident scenarios evaluated in the GMPEF Integrated Safety Analysis (ISA). These assessments of accidents include documents associated with the Paducah Site (DOE, 1999; DOE, 2004a; DOE, 2004b; DOE, 2020) and documents associated with NRC licensed enrichment facilities [redacted] (Trade Secret / Confidential Commercial Information)

4.12.3.1 *Accident Scenarios*

[redacted] (Trade Secret / Confidential Commercial Information). Criticality events and some UF_6 release scenarios were shown to result in potential radiological and HF chemical exposures, respectively, to the public. Gaseous releases of UF_6 react quickly with moisture in the air to form HF and UO_2F_2. Consequence analyses showed that HF was the bounding consequence for all gaseous UF_6 releases to the environment. For some fire cases, uranic material in waste form or in chemical traps provided the bounding case. Accidents that produced unacceptable consequences to the public resulted in the identification of various design bases, design features, and administrative controls.

[redacted] (Trade Secret / Confidential Commercial Information). These preventive controls reduce the likelihood of the accident (criticality events and HF release scenarios) such that the risk is reduced to acceptable levels as defined in 10 CFR 70.61. All HF release scenarios with the exception of those caused by seismic and for some fire cases are controlled through design features or by administrative procedural control measures.

Several accident sequences involving HF releases to the environment due to seismic or fire events were mitigated using design features to delay and reduce the UF_6 releases inside the buildings from reaching the outside environment. The seismic accident scenario considers an earthquake event of sufficient magnitude to fail the UF_6 process piping and some UF_6 components resulting in a large gaseous UF_6 release inside the buildings housing UF_6 process systems. The fire accident scenario considers a fire that causes the release of uranic material from open waste containers and chemical traps during waste drum filling operations. These mitigation features include automatic shutoff of building HVAC systems following a seismic event or during a fire event along with building features to limit building air leakage to the outside environment. With mitigation, the dose equivalent consequences to the public for these accident sequences have been reduced to below an intermediate consequence as defined in 10 CFR 70.61.

(Trade Secret / Confidential Commercial Information)

[redacted]

4.12.3.2 *Accident Mitigation Measures*

Potential adverse impacts for accident conditions are described in Section 4.12.3.1, *Accident Scenarios*. Several accident sequences involving HF releases to the environment due to seismic or fire events were mitigated using design features to delay and reduce the UF_6 releases inside the buildings from reaching the outside environment. These mitigative features include automatic shutoff of building HVAC systems following a seismic event or during a fire event along with building features to limit building air leakage to the outside environment. With mitigation, the dose equivalent consequences to the public for these accident sequences have been reduced to below an intermediate consequence as defined in 10 CFR 70.61.

4.12.3.3 *Non-Radiological Accidents*

[redacted] (Trade Secret / Confidential Commercial Information)

Table 4-16: [redacted] (Trade Secret / Confidential Commercial Information)

[redacted]	Number	Percent of Total
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

Table 4-16: [redacted] (Trade Secret / Confidential Commercial Information)

[redacted]	Number	Percent of Total
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]

Source: [redacted]
Key: [redacted]

4.12.3.3.1 Inadvertent Nuclear Criticality

An inadvertent nuclear criticality at the proposed GMPEF would result from the unintended accumulation of enriched uranium, leading ultimately to a self-sustaining or runaway nuclear chain reaction. A criticality accident could release large amounts of heat and radiation as well as produce radioactive fission products, such as isotopes of noble gases (e.g., xenon and krypton), radioiodine, and radiocesium.

A criticality safety program will be established prior to the license issuance in accordance with 10 CFR 70 and NRC Regulatory Guide 3.71, *Nuclear Criticality Safety Standards for Fuels and Material Facilities*. The program will include elements such as but not limited to criticality safety evaluations, postings and procedures, reporting of off-normal conditions, and emergency planning and response. The scope of criticality safety monitoring via the Criticality Accident Alarm System will be established during program development and will cover areas where the potential for criticality is deemed credible. As is the case for all environmental industrial safety programs, general employee training and job-specific training will be provided for the criticality safety program.

For the criticality accident, the material at risk is the amount of fission product radioactivity that would accumulate during the event (NRC, 1998). The damage ratio is 1, since all of the solution in the tank would be involved in the event. The atmospheric release fraction (ARF) for noble gases is 100 percent. The ARF for radioiodine is 0.25, and the ARF for other fission products is 5×10^{-4} (NRC, 1998). The respirable fraction is assumed to be 100 percent. [redacted]

(Trade Secret / Confidential Commercial Information). Industry experience with this type of criticality accident indicates that a worker located in the immediate vicinity of the reaction is not likely to survive the accident. However, with increasing distance from the accident, the radiation doses would be lower, and the probability that a worker could survive increases. At the enrichment facility, workers would have direct access to vessels and other process equipment in which criticality events would be possible. Therefore, the accident has been qualitatively evaluated as a high-consequence event for the worker.

Table 4-17: [redacted] (Trade Secret / Confidential Commercial Information)

Accident	Worker [a]		Environment at RAB	Individual at CAB, SW Direction		Direction	Collective Dose person-rem	LCFs
	U mg/m^3 (rem)	HF mg/m^3	U mg/m^3	U mg/m^3 (rem)	HF mg/m^3			
Inadvertent Nuclear Criticality	High [b]		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Hydraulic Rupture of a UF_6 Cylinder	High [b]		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Earthquake	Low		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fire in a UF_6 Handling Area	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Line Rupture	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Source: [redacted].
Key: [redacted]
Notes:
a [redacted]
b [redacted].
c [redacted].
d [redacted].
e [redacted].

The environmental consequence is evaluated using the sum-of-the-fractions rule. The concentration at the restricted area boundary of each fission product radionuclide generated during a hypothetical uranium solution criticality event (NRC, 1998) is compared to 5,000 times the corresponding values in Appendix B to 10 CFR Part 20. The fractions thus generated (i.e., calculated fission product concentrations divided by their Appendix B limits) are added to yield one value. If that value is less than 1, the accident consequences to the environment are low. Since the calculated sum was less than 1, the postulated criticality event was estimated to be a low consequence to the environment.

[redacted] (Trade Secret / Confidential Commercial Information)

[redacted] (Trade Secret / Confidential Commercial Information). This is a low consequence to this individual. Similarly, the low collective dose to the offsite population in the west sector [redacted] means that the risk of health effects to the offsite public (latent cancer) from this accident is low. In accordance with the performance requirements of 10 CFR Part 70, Subpart H, the operator has either identified Items Relied on for Safety to reduce the risk to the worker from all criticality accidents or identified safe-by-design components that meet criteria such that they are highly unlikely to fail.

4.12.3.3.2 Hydraulic Rupture of a UF_6 Cylinder in the Blending and Liquid Sampling Area

At the product blending and sampling area, Type 30B (2.5-ton [2.3-metric ton]) cylinders would be filled with product. The transfer of product to Type 30B cylinders would begin by heating a 14-ton (13-metric ton) Type 48Y cylinder containing enriched UF_6 inside a Blending Donor Station to no more than 61 degrees Celsius (142 degrees Fahrenheit). The heated UF_6 gas would be transferred by piping from the heated Type 48Y cylinder to a Blending Receiver Station containing a Type 30B cylinder. The Blending Receiver Station would be cooled, which would allow the UF_6 gas to desublime to a solid inside the Type 30B cylinder, completing the transfer.

An accident is postulated wherein the Blending Donor Station heater controller fails, causing the blending donor heater within the station to remain on. Were this to occur, the product cylinder could overheat and the cylinder could hydraulically rupture due to the expansion of the liquid UF_6. Upon cylinder rupture, the entire contents of the Type 48Y product cylinder (12,501 kilograms [27,560 pounds] of UF_6) would be released within the Blending Donor Station. Since the station enclosure is not airtight, the UF_6 would be released to the building. The UF_6, when in contact with air, would produce HF gas and UO_2F_2. The release into the building would then be released to the environment. The HVAC is conservatively assumed to be operating at the maximum ventilation flow rate. Significant quantities of HF and UO_2F_2 would be carried by the prevailing wind beyond the CAB. The results of the consequence assessment are presented in Table 4-17 and show the health and environmental consequences of this accident would be high.

A worker in the vicinity of the Blending Donor Station would be exposed within seconds to lethal UF_6, UO_2F_2, and HF concentrations. The environmental consequences are higher than the 5.4 mg U/m^3 threshold for an intermediate consequence. An individual located on the CAB in the [redacted] (Trade Secret / Confidential Commercial Information) would suffer high consequences from both uranium and HF exposure. The collective dose to the offsite population in the [redacted] (Trade Secret / Confidential Commercial Information) indicates a risk of several latent cancer fatalities in the population in the years following the accident.

[redacted]
(Trade Secret / Confidential Commercial Information). For example, in response to an alarm that indicates the release of UF_6, a control-room operator could secure the HVAC systems for the affected area. The action to secure the HVAC systems within minutes of the accident would considerably reduce the risk to the public and the environment.

4.12.3.3.3 Natural Phenomena Hazard—Earthquake

For all uranium processing, storage, and enrichment facilities, a severe earthquake is usually postulated as the bounding natural phenomena-initiated accident. [redacted]
(Trade Secret / Confidential Commercial Information). The trip system would detect earthquakes and secure the HVAC units. Therefore, for this evaluation, it is also assumed that the HVAC systems in affected process buildings would be shut down.

[redacted] (Trade Secret / Confidential Commercial Information). Depending on the location of the worker when the event occurs, the large quantity of UF_6 that could be released would result in a high consequence to this individual before he or she could escape the room. However, for seismic events, the worker is assumed to evacuate the area of concern upon detection of a seismic event, which results in a reduced exposure time and an acceptable risk. The consequences to the environment would be low. The MEI at the CAB in the [redacted] would not be expected to suffer any observable health effects. Similarly, the low collective dose to the offsite population in the [redacted] means that the risk of health effects to the offsite public (latent cancer) from this accident would be low.

4.12.3.3.4 Fire in a UF_6 Handling Area

A substantial fire is typically the bounding fire in a uranium facility. [redacted] (Trade Secret / Confidential Commercial Information) combustible material is postulated to breach a UF_6 transfer manifold. The release would involve approximately 3.4 kilograms (7.5 pounds) of UF_6 vapor.

The results of the consequence assessment are presented in Table 4-17. The consequences of this accident are low for the environment, the individual at the CAB, and the public off site. For the facility worker, the consequences are intermediate for acute chemical exposure to uranium. However, for fires, the worker is assumed to evacuate the area of concern once the fire is detected, which would result in an exposure time much shorter than 10 minutes, thus resulting in acceptable risk.

In accordance with the performance requirements of 10 CFR Part 70, Subpart H, [redacted] (Trade Secret / Confidential Commercial Information)has identified Items Relied on for Safety to ensure the risk of this type of accident remains low. To reduce the magnitude of fires resulting from the presence of transient combustible material, [redacted](Trade Secret / Confidential Commercial Information) would rely on administrative controls. The purpose of these controls is to prevent large fires that could result in the release of large inventories of UF_6.

4.12.3.3.5 Process Line Rupture in a Product Low-Temperature Takeoff Station

[redacted]
(Trade Secret / Confidential Commercial Information)Cold traps and chemical traps would be used at the facility to remove residual UF_6 and HF from process lines prior to discharging exhaust gases from these lines to the gaseous effluent vent system. An accident could occur if a product vent subsystem carbon trap became saturated with UF_6 caused by a small UF_6 leak through a product cold trap valve. Were this to occur, a UF_6 plug could form on the discharge of the vacuum pump, causing high pressure in the vacuum pump and thus failing seals leading to a release of approximately 1.0 kilogram (2 pounds) of UF_6 vapor to the UF_6 HandlingArea.

The results of the consequence assessment are presented in Table 4-17 and show that the consequences of this accident are low for the worker, the environment, the individual at the controlled area boundary, and the public off site.

In accordance with the performance requirements of 10 CFR Part 70, Subpart H, [redacted] (Trade Secret / Confidential Commercial Information) expects that the Items Relied on for Safety will ensure the risk of this type of accident remains low. For this accident, a preventive measure is a fail-safe, hard-wired, high-carbon trap weight trip of the vacuum pump. This equipment would be tested annually to ensure its availability and reliability to serve its intended safety function.

4.12.3.4 *Consequence Assessment for Land and Biota Effects*

The hydraulic rupture of a UF_6 cylinder is used to demonstrate the potential impacts that an accident would have on the surrounding land and biota. This accident releases the maximum quantity of UF_6 and thus bounds the impacts of all of the accidents described in this section.

The postulated rupture could release up to 12,500 kilograms (27,600 pounds) of UF_6 into the Blending Donor Station and then to the Sampling Area. The release into the building would then be released into the atmosphere. The consequences of such a release on the surrounding land and biota are considered by analogy with the consequences from a similar accident that occurred at the Sequoyah Fuels Corporation in January 1986 (NRC, 1986). A rupture of a cylinder containing 13,380 kilograms (29,500 pounds) of UF_6 was caused by a supervisor taking actions contrary to operating procedures. The rupture resulted in the release of UF_6 outside the building. The release formed a cloud consisting of the chemical products of UF_6 reacting with the moisture in the air to create UO_2F_2 and HF. It was estimated that 75 percent of the release occurred over 5 minutes with the remaining 25 percent of the release occurring over the subsequent 40 minutes. The plume was transported along with the wind which was blowing at 8 meters per second (18 miles per hour) with atmospheric stability class D.

Areas over which the release products from this accident at Sequoyah Fuels Corporation were deposited were estimated in NUREG-1189 (NRC, 1986). Uranium deposition of 13,600 milligrams per square meter (0.045 ounces per square foot) was found on site while an area of 7.68 square kilometers (2.97 square miles) was found to encompass uranium depositions of 1.36 milligrams per square meter (4.5×10^{-6} ounces

per square foot). Soil concentration action levels of 40 micrograms per gram for uranium and 350 micrograms per gram for fluoride were established based on health considerations.

Deposition rates were converted to soil concentration by assuming that the deposited material mixes with the upper centimeter (inch) of soil having a typical density of 2 grams per cubic centimeter (about 125 pounds per cubic foot). Uranium soil concentrations were then found to exceed the action level within an area of approximately 0.32 square kilometers (0.20 square miles). This area extended approximately 1 kilometer (0.6 miles) from the release location. The fluoride soil concentration action level was found to not extend off site. These effects at Sequoyah Fuels Corporation are expected to be somewhat greater than the effects that would result if a similar (bounding) accident were to occur at the proposed GMPEF.

4.12.4 Accident Analysis Summary

A representative subset of the potential accidents that could occur at the proposed GMPEF was selected and evaluated. [redacted] (Trade Secret / Confidential Commercial Information) would be expected at other enrichment facilities such as the GMPEF. The accident consequences vary in magnitude and include accidents initiated by natural phenomena, operator error, and equipment failure. Analytical results indicate that accidents pose acceptably low risks. The most significant accident consequences are those associated with the release of UF_6 caused by rupturing an overfilled and/or overheated cylinder. The proposed GMPEF design would reduce the risk (likelihood) of this event by using more a modern control system. In addition, the Emergency Plan addresses this type of event and all other lower-risk, high-consequence, and intermediate-consequence events. For the [redacted](Trade Secret / Confidential Commercial Information), the NRC staff concluded that through the combination of plant design, passive and active engineered controls (Items Relied on for Safety), and administrative controls, accidents would pose an acceptably low risk to workers, the environment, and the public. The same should also be true for the proposed GMPEF.

4.12.5 Cumulative Impacts

Nonradiological impacts to public and occupational health are anticipated to be SMALL since GMPEF operations would be managed through adherence to the air permit received from KDAQ (which are protective of human health and account for all area sources). The impacts associated with potential radiological exposures from the Proposed Action are anticipated to be SMALL for both workers and the public. Through the combination of plant design, passive and active engineered controls (Items Relied on for Safety), and administrative controls, accidents would pose an acceptably low risk to workers, the environment, and the public. Therefore, the GMPEF would not substantially contribute to cumulative public and occupational health impacts.

4.13 Waste Management Impacts

The construction, operation, and D&D of the GMPEF would generate wastewater and solid wastes, the quantities and management of which are described in this section. Waste generation information is also presented in Appendix A, *Facility Description.* This section describes the potential impacts projected to result from the management of waste generated by the Proposed Action (Section 4.13.1). Waste minimization plans for the Proposed Action are discussed in Section 4.13.2. A description of the projected cumulative waste management impacts is presented in Section 4.13.3. The controls that could be used to mitigate waste management impacts are discussed in Section 4.13.4.

4.13.1 Proposed Action

Under the Proposed Action, the GMPEF would generate wastewater and solid wastes requiring management. The sources and quantities of these wastes would vary over the life of the GMPEF. Waste minimization and pollution-prevention practices would be implemented to reduce the quantities of waste generated by the Proposed Action. Gaseous wastes from the Proposed Action are addressed as air emissions in Section 4.7, *Air Quality Impacts*.

4.13.1.1 *Construction Impacts*

Construction of the GMPEF would generate solid wastes that would need to be collected and transported off site for recycling or disposal. Predominately refuse and construction debris typical of industrial construction projects would be generated. The types of waste anticipated to be generated would include portions of trees and roots, paper, plastic, cardboard, packaging materials, wood scraps, metal building material scraps, roofing and insulation material scraps, masonry and cement scraps, and empty paint and coatings containers. Small quantities of organic solvent-based residuals remaining from application of specialty paints, architectural coatings, sealants, and adhesives, as well as wastes from other materials used during construction, may be required to be managed as hazardous waste. The specific compositions and quantities for these construction wastes will depend on the final facility design and construction methods employed. No radioactive waste is expected to be generated from construction during the initial 2-year construction phase.

The construction contractors selected for the GMPEF would have responsibility for the day-to-day supervision of onsite waste management and storage and for arranging for removal of these wastes from the GMPEF Site. Good work practices for waste management would be used to collect and sort the waste for recycling or disposal (e.g., using designated roll-off containers and collection areas for different types of waste).

Approximately 26 tons of hazardous waste could be generated during construction (NRC, 2011). Table 4-18 shows the types of hazardous waste expected to be generated during that period. Hazardous waste generated throughout the construction phase would be temporarily stored on site and then shipped to an offsite facility appropriate for handling the waste composition, in accordance with hazardous waste management regulations.

Table 4-18: Hazardous Waste Types and Quantities Expected during Facility Construction

Waste Type	Annual Quantity
Paints, solvents, thinners, organics	3,000 gallons
Petroleum products, oils, lubricants	3,000 gallons
Sulfuric acid (battery)	100 gallons
Adhesives, resins, sealers, caulking	2,000 pounds
Lead (batteries)	200 pounds
Pesticides	100 gallons

Source: NRC (2011)

Wastewater discharges generated during construction may include wastewater from foundation excavations dewatering, and vehicle and equipment wash (i.e., to avoid tracking soils off site and, if allowed, washing out concrete trucks, etc.). The construction contractors selected for the GMPEF would be responsible for the day-to-day supervision of wastewater generation and managing their discharges under KPDES stormwater permit and SWPPP.

There are waste management services and commercial capacity in the area to manage the expected construction wastes. Therefore, the waste and wastewater management impacts resulting from construction of the GMPEF would be SMALL.

4.13.1.2 *Operation Impacts*

GMPEF operation would generate sanitary wastewater and solid wastes. Sanitary wastewater would be collected and sent to the DOE sanitary sewer system for treatment at the C-615 STP before being discharged to local receiving waters via a DOE KPDES permitted Outfall 004 which then discharges through Outfall 008. Outfall 008 effluents discharge into Big Bayou Creek. Solid wastes generated by GMPEF operations would be collected for onsite sorting and packaging for eventual shipment to an offsite facility appropriate for treatment or disposal of the waste type.

4.13.1.2.1 Wastewaters

The sources and estimated quantities of wastewaters that would be generated by GMPEF operations are summarized in Table 4-19. A summary of the treatment and discharge practices planned to be used for the management of these wastewaters is presented in Table 4-20. The operational discharges would be in accordance with the DOE Paducah Site KPDES permit. Based on wastewater quantities and management practices presented in these tables, the wastewaters management impacts resulting from operation of the GMPEF would be SMALL.

Table 4-19: Types, Sources, and Quantities of Wastewaters Generated by GMPEF Operations

Wastewater Type	Source	Estimated Average Daily Quantity Generated
Radioactive liquid effluent	Wastewaters from GMPEF enrichment buildings decontamination rooms; process area floor drains, sinks, sumps, and mop water; laboratory area floor drains, sinks, sumps, and mop water; and building HVAC and cooling equipment condensate	TBD gpd [a]
Sanitary wastewater	Sanitary waste from building areas used by GMPEF workers (e.g., restrooms, break rooms)	10,000 gpd
Stormwater runoff	Stormwater runoff from GMPEF impervious surfaces (e.g., building roofs, parking lots, roads, outdoor storage pads, and other areas)	Variable depending on local precipitation

Key: DOE = United States Department of Energy, GeM = General Matter, Inc.; GMPEF = General Matter Paducah Enrichment Facility; gpd = gallons per day; HVAC = heating, ventilation, and air-conditioning
Note:
[a] This estimate is not currently ripe for analysis. Finalized estimates will be submitted as part of GeM's environmental monitoring plan.

Table 4-20: Management of Wastewaters Generated by GMPEF Operations

Wastewater Type	Onsite Waste Management	Offsite Waste Treatment/Disposal
Radioactive liquid effluent	GeM does not intend to release radioactive liquid waste. These wastewaters will be collected in a closed drain system from potentially radioactive sources connected to GMPEF LECS and shipped off site to a licensed disposal site. In the event of a fire sprinkler actuation, the GMPEF's stormwater basins are capable of restricting discharge to ensure sampling can occur prior to discharge.	Liquid LLRW shipped off site to a licensed waste management facility.

Table 4-20: Management of Wastewaters Generated by GMPEF Operations

Wastewater Type	Onsite Waste Management	Offsite Waste Treatment/Disposal
Sanitary wastewater	Conveyed to the DOE sanitary sewer system; no onsite treatment.	Sent to the DOE Paducah Site sanitary sewer system to be treated at the C-615 Sewage Treatment Plant and discharged to KPDES permitted Outfall 004, which then discharges through Outfall 008. Outfall 008 effluents discharge into Big Bayou Creek.
Stormwater runoff	GeM will obtain KPDES permit coverage for two additional outfalls to Bayou Creek and Little Bayou Creek. Stormwater runoff would then be conveyed to new permitted outfalls.	Stormwater would be conveyed to new outfalls. No offsite treatment is to be expected.

Key: DOE = United States Department of Energy; GEM = General Matter, Inc.; GMPEF = General Matter Paducah Enrichment Facility; KPDES = Kentucky Pollutant Discharge Elimination System; LECS = Liquid Effluent Collection System; LLRW = low-level radioactive waste

4.13.1.2.2 Solid Wastes

Operation of the GMPEF would generate refuse and other nonhazardous solid waste, Resource Conservation and Recovery Act (RCRA) hazardous wastes, LLRW, and mixed LLRW. In addition, DUF_6 would be produced by the uranium-enrichment process. No high-level radioactive wastes would be generated by GMPEF operations. The following amounts of waste are expected to be generated during operations:

- Solid Waste – 406,000 pounds/year
- Hazardous Waste –4,000 pounds/year
- LLRW – 322,000 pounds/year
- Mixed LLRW – 220 pounds/year

The types, sources, and estimated quantities of radiological and mixed waste that would be generated by GMPEF operations are summarized in Table 4-21. A summary of the storage, treatment, and disposal practices planned to be used for the management of the wastes is presented in Table 4-22. Based on the solid waste quantities and management practices presented in these tables, the solid waste management impacts resulting from operation of the GMPEF would be SMALL.

Table 4-21: Radiological and Mixed Waste Types and Quantities Expected during Facility Operation

Waste Type	Annual Quantity (pounds)	Uranium Content (pounds)
Activated carbon	1,300	110
Activated alumina	9,500	9.7
Perfluoropolyether oil	4,500	22
Liquid waste treatment sludge [a]	4,600	250 [b]
Activated sodium fluoride [c]	-	-
Assorted materials (paper, clothing, etc.)	9,300	130
Ventilation filters	200,000	24
Non-metallic components	22,000	Trace [d]
Miscellaneous mixed wastes (organic compounds) [e]	220	8.8
Combustible waste	15,000	Trace [d]
Scrap metal	53,000	Trace [d]

Source: NRC (2011) (rounded to 2 significant figures)
Notes:
[a] Sludge and evaporator concentrates.

Table 4-21: Radiological and Mixed Waste Types and Quantities Expected during Facility Operation

Waste Type	Annual Quantity (pounds)	Uranium Content (pounds)

[b] Value is composed of uranium in the citric acid and degreaser tanks, precipitated aqueous solutions, uranium in precipitated laboratory/miscellaneous effluents, and uranium in sludge from the citric acid and degreaser tanks.
[c] No wastes are produced on an annual basis. Sodium fluoride traps are not expected to saturate over the life of the plant.
[d] Not detectable above naturally occurring background concentrations.
[e] Representative organic compounds consist of acetone, toluene, ethanol, and petroleum ether.

Table 4-22: Management of Solid Wastes [a] Generated by GMPEF Operations

Solid Waste Source	Onsite Waste Management	Offsite Waste Treatment/Disposal
MSW	Collected and temporarily stored in standard dumpsters	Filled dumpsters transported by commercial refuse collection service to McCracken County Area Landfill. [b]
Nonhazardous wastes from operations equipment cleaning and maintenance activities that are recyclable or not accepted by MSW landfill	Collected and temporarily stored in containers	Filled containers transported by truck to permitted recycling or treatment and disposal facilities.
Wastes designated as RCRA hazardous wastes	Waste collected and packaged in Department of Transportation-approved shipping containers and temporarily stored on site in compliance with the RCRA permit.	At least once every 180 calendar days, the containers would be transported by truck to the RCRA-permitted treatment, storage, and disposal facility.
LLRW	Collected and temporarily stored in containers	Filled containers transported by truck to a commercial LLRW management facility such as Energy*Solutions* disposal facility [c] in Clive, Utah, or WCS in Andrews County, Texas.
Mixed LLRW	Collected and temporarily stored in containers in compliance with RCRA permit	Filled containers transported by truck to a commercial RCRA permitted mixed LLRW management facility.
UF_6 tails	Filled 48G or 48Y cylinders moved to on site, outdoor, concrete, UF_6 storage pad for interim storage until offsite shipment.	Filled 48G or 48Y cylinders transported by truck to DUF_6 conversion facilities [d] at DOE sites in Paducah, Kentucky, or Portsmouth, Ohio, or to a commercial DUF_6 conversion facility, should one become available.

Key: DOE = United States Department of Energy; DUF_6 = depleted uranium hexafluoride; LLRW = low level radioactive waste; MSW = municipal solid waste; RCRA = Resource Conservation and Recovery Act; UF_6 = uranium hexafluoride; WCS = Waste Control Specialists
Notes:
[a] Includes liquid and semi-solid wastes that are stored and managed in tanks or containers.
[b] Licensed RCRA subpart D landfill.
[c] Licensed LLRW disposal facility.
[d] Licensed depleted-uranium conversion facilities operating under contract to the DOE at existing DOE facility sites in Portsmouth, Ohio, and Paducah, Kentucky.

4.13.1.2.2.1 Municipal Solid Waste Management

GMPEF operations would generate municipal solid waste (MSW). MSW includes typical office and breakroom wastes, including paper and foodstuffs. This waste would be collected and placed in standard dumpsters. A commercial refuse collection service would regularly pick up filled containers and transport the waste to an commercial landfill for disposal.

4.13.1.2.2.2 Other Nonhazardous Solid Waste Management

Nonhazardous solid wastes would be generated as a result of maintenance and repair activities. An example of this waste includes used filter media and assorted metal, wood, plastic and concrete. These wastes would be collected and temporarily stored in containers appropriate for the waste type. Depending on the composition of the nonhazardous waste, these materials would be either shipped to a recycling facility or directly for disposal in a commercial landfill.

4.13.1.2.2.3 RCRA Hazardous Waste Management

RCRA hazardous waste would be collected, packaged in DOT-approved shipping containers, and temporarily stored on site for shipment. At least once every 180 calendar days, the containers would be shipped to the RCRA-permitted treatment, storage, and disposal facility.

4.13.1.2.2.4 Low-Level Radioactive Wastes Management

Used uranium-contaminated items (e.g., filters, pumps, motors, valves, metal containers, process piping segments, various filtrates) would be shipped off site for disposal. The sources and estimated quantities of LLRW that would be generated by GMPEF operations are summarized in Table 4-21. These materials would be collected and packaged in DOT/NRC-approved shipping containers, which would then be stored temporarily on site. The material may be compacted using a waste compactor. When a full truckload is collected, the containers would be shipped to the LLRW disposal facility operated by Energy*Solutions* in Clive, Utah, Waste Control Specialists (WCS) in Andrews County, Texas, or another commercial radioactive waste disposal facility. The packaging and transportation of the LLRW from the GMPEF to the disposal facility is discussed in Section 4.3.3, *Radioactive Material Transportation Impacts*.

4.13.1.2.2.5 Mixed Low-Level Radioactive Wastes Management

The sources and estimated quantities of mixed LLRW that would be generated by GMPEF operations are summarized in Table 4-21. Mixed LLRW would be handled and stored in a similar manner to the RCRA hazardous waste.

4.13.1.2.2.6 Onsite DUF_6 Management

Depleted UF_6 (referred to as "UF_6 tails" or "DUF_6") produced during enrichment would be temporarily stored at the GMPEF in 48G (preferred) or 48Y cylinders until the material can be shipped off site to other facilities for further processing and ultimate disposal, as discussed in Section 4.13.1.2.2.7, *Offsite DUF_6 Management*. There would be no onsite processing or disposal of the DUF_6 at the GMPEF.

Temporary onsite storage of the DUF_6 cylinders at the GMPEF would be on outdoor storage pads[9]. These storage pads would be designed to provide storage capacity for approximately 20,000 48-inch diameter cylinders, which is equivalent to the quantity of DUF_6 expected to be generated from approximately 26 years of GMPEF operation at full production once both Phase 1 and Phase 2 are operational. This

9 The licensing of Depleted-up-to-Natural UF_6 cylinder storage pads through the Commonwealth of Kentucky, to include the construction, operation, and eventual decommissioning has been evaluated in the *Environmental Assessment (EA) for General Matter's Site Preparation and Licensing Activities in Parcel A of the Paducah Site in McCracken County, KY* (DOE/EA-2327).

estimate is based on average production rates of 365 cylinders per year for Phase 1 (ranging from 174 to 555 cylinders per year) and 398 cylinders per year for Phase 2 (ranging from 265 to 530 cylinders per year), resulting in a combined average production of approximately 763 cylinders per year. Under maximum production scenarios across both phases, the storage capacity could accommodate approximately 18 years of operation. These estimates have a moderate degree of variability due to different operational modes and production scenarios during each phase.

Secondary tails produced during enrichment of the DUF_6 from the DOE Paducah Site would be returned to the DOE Paducah Site in an expeditious manner, with small quantities of 48G cylinders temporarily stored on site.

It is anticipated that at least one of the offsite DUF_6 disposition options discussed in Section 4.13.1.2.2.7, *Offsite DUF_6 Management* would be available. GeM does not expect the onsite DUF_6 cylinder storage pad to reach its NRC-licensed capacity. If this were to occur, GeM would fully evaluate available options at that time, including possible expansion of the DUF_6 onsite storage capacity beyond 20,000 cylinders. If necessary, GeM would apply to the NRC for any required license amendment and perform the appropriate safety and environmental analyses at that time.

Layout for the storage pads would use double or triple stacking of the 48-inch diameter cylinders and allow for moving of the cylinders with gantry cranes or straddle carriers. The storage pads would be constructed of concrete and would occupy up to approximately 450,000 square feet of outdoor area within the GMPEF Site if double stacking is used and even less area if triple stacking is used. The terrain surrounding the storage pad would be graded to provide collection and drainage of stormwater. Runoff would be monitored. Action levels would be established so that any upset conditions are detected early and corrected to prevent an inadvertent release to the environment in exceedance of permitted limits.

The entire perimeter of the storage pad would be fenced for security purposes and to protect worker health and safety. A single-entry gate to the storage pad would provide worker access, which would be restricted to authorized personnel. Concrete cradles would be used to elevate the cylinders above the storage pad surface. A diesel-powered or electric, self-propelled gantry crane would be used to move the DUF_6 cylinders.

Each DUF_6 cylinder would initially be inspected prior to placing a filled cylinder on the storage pad and, thereafter, would be periodically inspected for damage or surface coating defects. The inspection criteria are also discussed further in Section 5.12, *Waste Management*.

The impacts on waste management from onsite DUF_6 cylinder storage would be SMALL. The health effect of exposure to stored cylinders is described in Section 4.12, *Public and Occupational Health Impacts*.

4.13.1.2.2.7 Offsite DUF_6 Management

It is important to note that DOE expects the construction of the GMPEF will accelerate cleanup activities at the Paducah Site by repurposing legacy material. The Lease of Parcel A guarantees GeM a minimum of 7,600 cylinders of existing UF_6 (DOE, 2025f). These cylinders will provide material in the exact chemical form required for enrichment, thus offering GeM a supply of feed material as well as reducing DOE-EM's liability to process DUF_6 as part of its cleanup mission. DOE expects GeM's repurposing of this legacy material will save U.S. taxpayers approximately $800 million in avoided disposal costs (DOE, 2025b). Additionally, it may shorten GeM's production timeline by nearly a decade by eliminating the need for mining and milling as well as establishing a conversion capacity.

This section, however, discusses current options for offsite disposition of DUF_6, which include DOE conversion and/or commercial conversion to a depleted uranium oxide (in the form of [UO_2] or triuranium octoxide [U_3O_8]) for disposal in a licensed disposal facility.

Transfer of DUF_6 to DOE for Conversion into DU Oxide Pursuant to Section 3113 of the United States Enrichment Corporation Privatization Act

Section 3113 of the United States Enrichment Corporation (USEC) Privatization Act, 42 U.S.C. 2297h-11 (2006) directs DOE, upon request and subject to reimbursement of its costs, to "accept for disposal" DU generated by NRC-licensed uranium enrichment facilities, such as the DUF_6 that would be generated by the GMPEF. Section 311 of Public Law 108-447 amended Section 3113 of the USEC Privatization Act in 2004 by adding a new paragraph (4) to subsection (a). The new paragraph provides that, if a licensee requests DOE to accept for disposal DU pursuant to Section 3113(a), then DOE "shall be required to take title to and possession of such depleted uranium at an existing DOE DUF_6 storage facility." The Commission has ruled that DU is considered a form of LLRW (in the Matter of Louisiana Energy Services, L.P. [LES] NEF, Docket Number 70-3103-ML, Commission Memorandum and Order, CLI-05-20, 62 NRC 523 [Oct. 19, 2005]). The Commission also has concluded that "disposal of [UF_6 tails] by DOE represents a 'plausible strategy' under the USEC Privatization Act" (42 U.S.C. §2297h).

As part of the DOE's plans to comply with this legislative directive, they contracted for the construction of two uranium deconversion facilities. One facility, at the Paducah Site located near Paducah, Kentucky, is designed to have an annual DUF_6 processing capacity of approximately 18,000 MT/year. The second facility located at the DOE Portsmouth Site in Portsmouth, Ohio, is designed to have an annual DUF_6 processing capacity of approximately 13,500 MT/year (GLE, 2025; DOE, 2004a; DOE, 2004b). Physical construction of these facilities has been completed, and they have begun conversion operations. Since February 1, 2017, Mid-America Conversion Services LLC has been the contractor for the operation of both facilities (GLE, 2025; DOE, 2024d).

Environmental Impacts of Conversion of DUF_6 by DOE at the Paducah and Portsmouth DUF_6 Conversion Facilities

One offsite disposition option for the DUF_6 generated by the GMPEF would be to ship the DUF_6 cylinders to either of the DOE's conversion facilities (i.e., the Paducah or Portsmouth facility). The packaging and transportation of the DUF_6 from the GMPEF to these DOE DUF_6 conversion facilities are discussed in Section 4.3.3, *Radioactive Material Transportation Impacts*. Once delivered to these facilities, the DUF_6 would be converted into uranium oxide. Aqueous HF would also be a product of the conversion process. The HF has commercial value and would be sold for use, and the uranium oxide product would be reused to the extent possible or packaged for disposal at an appropriate LLRW disposal facility. DOE has analyzed the environmental impacts of the construction, operation, and decontamination and decommissioning of the Paducah and Portsmouth DUF_6 conversion facilities. DOE considered the impacts resulting from the disposal of HF (as calcium fluoride after neutralization) and depleted uranium oxide in the event that these materials cannot be sold and/or reused and determined that the impacts would be SMALL (DOE, 2004a; DOE, 2004b; DOE, 2020).

Cumulative Impacts of DOE DUF_6 Conversion Facility Operations

At full production capacity, the GMPEF would generate approximately 9,464 MT of DUF_6 per year. This annual DUF_6 generation rate is equivalent to approximately 53 percent of the 18,000 MT annual DUF_6 processing rate of the Paducah DUF_6 conversion facility and approximately 70 percent of the 13,500 MT annual DUF_6 processing rate of the Portsmouth DUF_6 conversion facility (DOE, 2020). However, 7,600 cylinders would be reused tails that DOE was already planning to convert to a more stable waste form.

In addition, it is possible that DUF_6 from other NRC-licensed commercial enrichment facilities, such as LES's NEF and Centrus' ACP located in Piketon Ohio, and the proposed PLEF, could be transferred to DOE pursuant to Section 3113 of the USEC Privatization Act. This would add to the inventory of material needing conversion at the Portsmouth and/or Paducah DUF_6 conversion facilities.

DOE has recognized that the DUF_6 conversion facilities at Paducah and Portsmouth may need to operate longer than initially planned to process waste transferred to DOE from proposed commercial enrichment facilities. In fact, DOE's Final Environmental Impact Statements (FEISs) for these facilities stated that "…it is reasonable to assume that the depleted-uranium conversion facilities could be operated longer than specified in the current plans to convert this material" (GLE, 2025; DOE, 2004a; DOE, 2004b; DOE, 2020). The *Final Supplemental Environmental Impact Statement for Disposition of Depleted Uranium Oxide Conversion Product Generated from DOE's Inventory of Depleted Uranium Hexafluoride* (referred to as the DU Oxide Disposal Supplemental Environmental Impact Statement [SEIS]) (DOE, 2020), estimated that the Paducah and Portsmouth DUF_6 conversion facilities could operate for up to 44 and 32 years, respectively, processing the existing inventory of DUF_6. The DU Oxide Disposal SEIS further estimated that processing an additional 150,000 MT of commercially generated DUF_6 could extend the operating periods for the Paducah and Portsmouth plants by 8 and 11 years, respectively.

DOE concluded that the estimated impacts that would occur from prior depleted-uranium conversion facility operations would remain the same when processing DUF_6 from a commercial enrichment facility, and that the overall cumulative impacts from operation of the depleted-uranium conversion facility would increase proportionately with the increased life of the facility (GLE, 2025; DOE, 2004a; DOE, 2004b; DOE, 2020).

The NRC analyzed the radiological impacts from the processing of DUF_6 received from two previously licensed commercial uranium-enrichment facilities (specifically, the NEF in Lea County, New Mexico, and the ACP in Piketon, Ohio), in addition to the DOE's existing DUF_6 inventory at the Paducah and Portsmouth depleted-uranium conversion facilities (GLE, 2025; NRC, 2005; NRC, 2006). In addition, the NRC considered the impacts of NEF- and ACP-generated DUF_6 on the DOE DUF_6 conversion facility operations, taking into account the relative amount of additional material compared to DOE's existing DUF_6 inventory. With respect to the NEF, the analysis was for a uranium-enrichment facility generating and shipping 7,800 MT of DUF_6 per year to the DOE's DUF_6 conversion facilities (GLE, 2025; NRC, 2005). The NRC concluded that the additional radiological impacts of converting the DUF_6 from the NEF at the DOE DUF_6 conversion facilities would be SMALL (GLE, 2025; NRC, 2005). In the ACP FEIS, the NRC similarly concluded that the added inventory of DUF_6 coming from the proposed ACP should not change the nature or magnitude of the impacts from the DOE DUF_6 conversion facility operations, though it would extend those impacts for additional years. The NRC considered the overall impacts on the DOE DUF_6 conversion facility operations to be MODERATE, given that the maximum amount of 571,000 MT of DUF_6 generated by the proposed ACP would require DOE to significantly extend the life of the Portsmouth DUF_6 conversion facility or to construct a second DUF_6 conversion facility (GLE, 2025; NRC, 2006).

The projected maximum amount of new DUF_6 generated by the GMPEF over a 40-year operating period is 379,000 MT. Based on the NRC's prior analyses (GLE, 2025; NRC, 2005; NRC, 2006), the additional impacts for converting additional quantities of DUF_6 similar to those expected to be generated by the GMPEF at the DOE's Paducah and Portsmouth DUF_6 facilities would be SMALL. With respect to throughput, the overall impacts on the DOE DUF_6 conversion facility operations are smaller but a similar order of magnitude to those for the ACP, which the NRC concluded to be MODERATE.

Transfer of DUF_6 to a Commercial Conversion Facility for Conversion to DU Oxide

As described in the PLEF ER (GLE, 2025), although the NRC has deemed transfer of DUF_6 to DOE to be a plausible disposition strategy, it is conceivable that NRC-licensed commercial enrichers could also pursue an alternative DUF_6 disposition path. Specifically, to ship DUF_6 to a commercial conversion facility, should one or more commercial conversion facilities become available. In the NEF licensing proceeding, the Atomic Safety and Licensing Board found the potential construction and operation of a DUF_6 conversion facility in the United States sufficient to satisfy the licensee's projected timing and throughput requirements, to be a plausible strategy for conversion of DUF_6 (in the Matter of LES, L.P. NEF, Docket

Number 70-3103-ML, Atomic Safety and Licensing Board, Third Partial Initial Decision [Safety-Related Contentions], LBP-06-15, 63 NRC 591 [May 31, 2006]) (GLE, 2025; LES, 2006).

International Isotopes Fluorine Products, a subsidiary of International Isotopes, Inc., for example, obtained a license in 2012 to construct a new conversion facility that would process DUF_6 received from U.S. uranium-enrichment facilities for a fee. The facility was designed to use technology similar to DOE DUF_6 conversion facilities, with an initial capacity to process approximately 4,990 MT of DUF_6 per year (GLE, 2025; NRC, 2020). Though the facility has not been built, its assets were recently sold to American Fuel Resources LLC (GLE, 2025; International Isotopes, 2024). The impacts of conversion of DUF_6 generated by the GMPEF at this commercial facility are expected to be similar to the impacts determined for the Paducah or Portsmouth conversion facilities because all of these facilities will convert DUF_6 to uranium oxide and a salable fluorine byproduct.

The NRC's impact analysis for the proposed NEF (GLE, 2025; NRC, 2005) included the option of shipping DUF_6 cylinders to a commercial conversion facility (i.e., privately owned and operated) located at Metropolis, Illinois, which is relatively near Paducah, Kentucky. The NRC concluded that the impacts of conversion at a private facility would be similar to the DOE DUF_6 conversion facilities because it is assumed that the facility design of a private conversion facility would be similar to the DOE conversion facilities. The analysis concluded that the impacts for converting the DUF_6 generated by the proposed NEF at commercial conversion facilities would be SMALL.

Therefore, while additional site-specific environmental analysis would be required for the construction and operation of any future private DUF_6 conversion facility to which GeM might send DUF_6, the impacts of converting the DUF_6 generated by the GMPEF at commercial conversion facilities are expected to be SMALL.

Environmental Impacts of Disposal of DUF_6 in a Licensed Disposal Facility

Regardless of which depleted-uranium conversion facility receives UF_6 tails from the GMPEF, LLRW generated from the conversion of the DUF_6 into uranium oxide and/or tri-uranium octoxide would be transported to a licensed commercial LLRW disposal facility for final disposal. In CLI-05-20, the NRC explained that 10 CFR 61.55(a)(6), Waste classification, specifies that if radioactive waste does not contain any of the radionuclides listed in either of two listed waste classification tables, it is Class A waste. The NRC concluded that, because DU does not contain the radionuclides listed in the specified tables, "under a plain reading of the regulation, depleted uranium is a Class A waste." (GLE, 2025; NRC, 2008).

As discussed in the FEISs for the proposed NEF and ACP, the NRC reviewed the Waste Acceptance Criteria for the Energy*Solutions* disposal facility in Clive, Utah, and confirmed that these criteria permit the disposal of depleted uranium oxide forms in Class A disposal cells with no volume restrictions (GLE, 2025; NRC, 2005; NRC, 2006). The NRC concluded that the potential impact from disposal of the oxide form of DU at the Energy*Solutions* facility is SMALL (GLE, 2025; NRC, 2005; NRC, 2006).

DOE also evaluated the feasibility and environmental impacts of near-surface disposal of DU oxide and reached conclusions consistent with those of the NRC (GLE, 2025; DOE, 1999; DOE, 2004a; DOE, 2004b; DOE, 2020). DOE analyzed the human health impacts from long-term disposal of uranium oxide in their Programmatic EIS on the disposal of DU (DOE, 1999). The Programmatic EIS included a generic assessment of disposal of DU oxide (in the form of U_3O_8 or UO_2), in either ungrouted or grouted form, in a generic wet or dry environment. DOE's analysis determined that the long-term disposal of DU in the oxide form at a "generic dry location" is feasible. In particular, DOE determined that, for shallow earthen structures in a dry setting, the chemical stability of the oxide form, combined with the low infiltration rate of water into the material and greater depth to groundwater, results in essentially no radiological impacts on groundwater or human health.

In the *Final Supplemental Environmental Impact Statement for Disposition of Depleted Uranium Oxide Conversion Product Generated from DOE's Inventory of Depleted Uranium Hexafluoride* (DU Oxide Disposal SEIS) (DOE, 2020), DOE evaluated transportation and disposal of DU oxide generated from DUF_6 conversion at the Paducah and Portsmouth Sites at the EnergySolutions facility in Clive, Utah, the Nevada Nuclear Security Site, in Nye County, Nevada, and WCS site near Andrews, Texas. DOE determined that waste disposal volumes would not be expected to exceed the capacities of any of the three waste disposal facilities. In the Record of Decision for this SEIS (85 Federal Register 34610), DOE decided to disposition DU oxide at one or more of the disposal sites evaluated in the Final DU Oxide Disposal SEIS.

In summary, based on the foregoing information, including the referenced NRC and DOE NEPA analyses, it is expected that the environmental impacts of disposal of DUF_6 (after conversion to depleted U_3O_8) at an appropriately licensed LLRW disposal facility would be SMALL.

Impacts of Disposal of DUF_6 from the Proposed GMPEF on LLRW Disposal Capacity

The quantity of depleted uranium generated as a result of GMPEF operations would also affect the available disposal capacity for such material. The NRC determined that the total amount of DUF_6 estimated to be generated by the proposed ACP (which, as noted above, is similar to the total amount of DUF_6 projected for the GMPEF) would take up approximately 11 percent of the remaining Energy*Solutions* facility capacity. Given this small fraction and the fact that some of the proposed ACP's converted DU could be disposed at the Nevada Nuclear Security Site, if necessary, NRC stated that the impacts on available disposal capacity are expected to be SMALL (GLE, 2025; NRC, 2006).

4.13.1.3 *Decontamination and Decommissioning Impacts*

The plans for GMPEF D&D are described in Section 2.1.2.1.3, *Decontamination and Decommissioning*. With the permanent cessation of enrichment operations, sanitary wastewater quantities generated by the GMPEF would decrease from levels generated during operations to eventually zero by the end of the D&D phase. During the later phases of D&D, portable toilets would be used. During the D&D phase, radioactive-contaminated solutions generated from GMPEF decontamination activities would be collected in the GMPEF LECS and managed as described in Section 4.13.1.2.1, *Wastewaters*, until this system is decommissioned. Stormwater would continue to be routed from the GMPEF's stormwater drainage system to the DOE stormwater system during the D&D phase and after closure. Therefore, wastewater management impacts resulting from decommissioning of the GMPEF would be SMALL.

Solid wastes would be generated by the removal of used process equipment from inside the buildings and by demolition of the buildings and other structures at the site. Used equipment and building materials would be shipped off site to salvage, recycle, or disposal facilities, as appropriate for the waste type. Wastes to be disposed of are estimated to include 10,070 cubic yards of LLRW (NRC, 2011). Radioactive-contaminated equipment and materials removed during decommissioning would be shipped to a licensed treatment or disposal facility (as appropriate for the material type) or disposed of in a manner authorized by the NRC. Similarly, hazardous waste and mixed LLRW materials removed during decommissioning would be shipped to a RCRA-permitted treatment, storage, and disposal facility or an appropriate licensed recovery facility. Therefore, solid waste management impacts resulting from D&D of the GMPEF would be SMALL.

4.13.2 Waste Minimization Plan

Waste minimization involves the implementation of practices that either reduce the quantity of waste generated by a source; recycle or reprocess the material so that it can be reused, thereby avoiding the need to dispose of the material as a waste; or treat the waste to remove hazardous constituents or reduce the waste volume (GLE, 2025).

Prior to finalization of the GMPEF design, GeM would review the planned GMPEF operations and associated waste streams to evaluate if the design supports best practices for waste minimization. The design would be adjusted to accommodate recommendations from this initial waste stream assessment. As part of the preparations for start-up of GMPEF operations, GeM would develop and implement a written waste minimization plan for GMPEF operations. The goal of this waste minimization plan would be to reduce targeted waste activities to the minimum technically feasible and economically practicable by the implementation of projects and work practices for GMPEF operations identified in the plan. GeM would work towards achieving these waste reductions by a combination of waste reduction assessments, procedural improvements, equipment and manufacturing process improvements, material substitution, employee training, and other reduction methods, as applicable and appropriate to the uranium-enrichment technology used at the GMPEF. The waste minimization plan for the GMPEF would comply with applicable regulatory agency requirements for waste minimization plans, including those specified in 10 CFR 20.1406, *Minimization of Contamination*.

4.13.3 Cumulative Impacts

The GMPEF would generate wastewater and solid wastes at the GMPEF Site requiring subsequent management. The impacts from the management of these wastes would not be cumulative over the construction, operation, and decommissioning phases of the Proposed Action, with one exception: solid wastes sent off site to a facility for landfill disposal would cumulatively consume a portion of the permitted landfill capacity. Cumulative impacts resulting from the Proposed Action are described in Section 4.13.3.1, *Wastewaters Cumulative Impacts*, and in Section 4.13.3.2, *Solid Wastes Cumulative Impacts*.

4.13.3.1 *Wastewaters Cumulative Impacts*

As described in Section 2.4, *Cumulative Effects*, the DOE Paducah Site lies to the north of the GMPEF Site and there are several offsite projects scheduled to occur within the vicinity of the GMPEF. This includes the new PLEF (GLE, 2025) proposed to be constructed adjacent to the GMPEF, and the turnover of areas to the east of the GMPEF Site for industrial development (DOE, 2025a).

As described in Section 4.13.1.1, *Construction Impacts*, sanitary wastewater would be collected in portable toilets and managed off site and stormwater would be managed in compliance with the KPDES stormwater general permit and SWPPP. Assuming stormwater generation is proportional to the size of the area drained, the stormwater that originates from the 107-acre GMPEF Site would be approximately 17 percent of the stormwater from the 615-acre industrial portion of the DOE Paducah Site. Therefore, stormwater from the GMPEF Site would have a SMALL to MODERATE impact on the DOE stormwater management system. The GMPEF would not substantially contribute to cumulative stormwater impacts in the region.

During operations, the sanitary wastewater flow from the GMPEF would be about 10,000 gpd as described in Table 4-19. Wastewater from the GMPEF would be conveyed to the DOE C-615 STP for treatment and release through KPDES permitted outfalls. The average daily effluent processed at the DOE C-615 STP is about 115,000 gpd. The effluent discharged from the GMPEF would be approximately a 9 percent increase of the wastewater managed at the DOE Paducah Site STP and therefore would have minor cumulative impacts on this system.

4.13.3.2 *Solid Wastes Cumulative Impacts*

The solid wastes generated by GMPEF construction, operations, and D&D (with the exception of DUF_6, which is a waste stream unique to enrichment facilities), would be shipped to local commercial waste management facilities as appropriate to the waste type (see Table 4-22), or sent out of State to specialized waste management firms.

The MSW generated by the GMPEF would add to the total MSW quantity collected throughout McCracken County and disposed in the local landfills by an estimated 203 tons/year (406,000 pounds/year). The PLEF is estimated to generate an additional 380 tons/year of MSW (GLE, 2025). The City of Paducah (in McCracken County) generates 28,000 tons of MSW per year, which is disposed of in a regional landfill (GLE, 2025; McCracken County, 2024). Therefore, additional municipal waste going to the regional landfill from the GMPEF is insignificant and would not substantially add to cumulative impacts.

The operation of the GMPEF is projected to increase the quantity of RCRA hazardous waste shipped to waste management facilities by 2 tons/year (4,000 pounds/year). The PLEF is estimated to generate an additional 16 tons/year (GLE, 2025). It is expected there would be ample capacity at existing hazardous waste management facilities to manage these wastes without substantial cumulative impacts (GLE, 2025; Heritage Environmental Services, 2024). A minor amount of mixed LLRW (220 pounds/year) is expected to be generated by operation of the GMPEF. This minor amount of mixed LLRW is not expected to substantially contribute to cumulative impacts.

GMPEF operations would increase the amount of LLRW shipped to the Energy*Solutions* disposal facility in Clive, Utah (or other available facilities), by approximately 161 tons/year (322,000 pounds/year). The PLEF is estimated to generate an additional 458 tons/year (GLE, 2025). It is expected there would be ample capacity at existing LLRW disposal facilities to manage these wastes without substantial cumulative impacts (GLE, 2025; Energy Solutions, LLC, 2024).

In view of the potential for construction and operation of multiple new commercial enrichment facilities in the United States, the NRC evaluated the potential cumulative impacts of disposing of DU from multiple sources or facilities on national waste disposal capacity (GLE, 2025; NRC, 2006). The NRC considered DOE's existing inventories of DU (as described in DOE's 2004 site-specific Paducah and Portsmouth EISs) and the estimated total amounts of DU to be generated by the proposed NEF and ACP facilities during their operating lives. The specific quantitative assumptions are set forth in the ACP FEIS. The NRC determined that the aggregate amount of depleted U_3O_8 that would be generated from converting the DUF_6 produced by the proposed ACP, the DUF_6 produced by the NEF, and the DUF_6 stored at the Portsmouth and Paducah Sites would represent approximately 20 percent of the available disposal capacity of the Energy*Solutions* facility (GLE, 2025; NRC, 2006). More recent information indicates that the impact on Energy*Solutions* facility's overall disposal capacity would be even smaller due to a significant recent expansion of licensed Class A disposal capacity (now estimated by DOE to be 190.6 million cubic feet [5.4 million cubic meters]) (GLE, 2025; DOE, 2007). In addition, the WCS Facility near Andrews, Texas, also has capacity for disposal of DU oxide. Accordingly, based on the above information, it is anticipated that the cumulative effect of the generation and disposal of DU on national LLRW disposal capacity would be SMALL.

These facilities have adequate capacity to continue accepting solid waste materials generated at the GMPEF and PLEF for the foreseeable future. Therefore, the cumulative solid waste management impacts, and the contribution to these impacts from the GMPEF, would be SMALL.

4.13.4 Control of Impacts

Waste management impacts resulting from the GMPEF would be controlled by minimizing the quantities of waste generated by the GMPEF by implementing the waste minimization plan discussed in Section 4.13.2, *Waste Minimization Plan*. The waste management impact mitigation measures that would be applied to the Proposed Action are further discussed in Section 5.12, *Waste Management*.

5.0 MITIGATION MEASURES

Nuclear Regulatory Commission Report (NUREG)-1748 (NRC, 2003) defines mitigation as "Actions and decisions that: (i) avoid impacts altogether by not taking a certain action or parts of an action; (ii) minimize impacts by limiting the degree or magnitude of an action; (iii) rectify the impact by repairing, rehabilitating, or restoring the affected environment; (iv) reduce or eliminate the impact over time by preservation and maintenance operations during the life of the action; or (v) compensate for an impact by replacing or providing substitute resources or environments."

This chapter summarizes potential mitigation measures to reduce potential, adverse impacts (see Chapter 4.0, *Environmental Impacts*) that could result from the construction, operation, and decommissioning of the General Matter Paducah Enrichment Facility (GMPEF). This chapter presents a reasonable range of mitigation options, from which appropriate measures will be selected and implemented. Specific mitigation measures will be defined as the facility design is finalized.

Mitigation measures proposed in this chapter identify strategies above and beyond those required by applicable Federal, State, and/or local regulatory requirements and permits, unless otherwise stated. This does not preclude additional mitigation measures that may be implemented by General Matter, Inc. (GeM) based upon its consultations with regulatory agencies. A summary of potential mitigation measures proposed for the GMPEF are provided at the end of this section in Table 5-1.

Table 5-1: Summary of Mitigation Measures Proposed by GeM

Impact Area	Activity	Proposed Mitigation Measures
Land Use	Land disturbance	Use existing roads and utility ROWs to the fullest extent practicable to minimize the need for additional ground disturbance.
Transportation	Traffic volume	Work with Kentucky Transportation Cabinet to evaluate driveway and roadway improvement options to minimize impacts.
		Schedule worker shift intervals so that shift start and end times are staggered from peak periods of worker commuting traffic for existing site facilities and other planned operations (when practical).
		Route truck shipments of radioactive materials around cities by using a U.S. Interstate Highway System bypass or beltway (when available).
		Schedule truck deliveries and shipments for off-peak traffic periods to reduce potential congestion on local roadways during peak worker commuting periods.
Geology and Soil Resources	Soil disturbance and contamination	Engineer design plans that minimize soil disturbance during construction activities.
		Use adequate containment methods during excavation and/or similar operations.
		Use site-stabilization practices (i.e., placing crushed stone on top of disturbed soil in areas of concentrated runoff).
		Use silt berms, dikes, and sediment fences.
		Stabilize drainage culverts and ditches by lining surface with rock aggregate/rip-rap to reduce flow velocity and prohibit scouring.
		Reuse and/or appropriately place excavated materials where practical to decrease exposed soil piles.
		Place gravel construction pads at the entrances/exits of construction areas.

Table 5-1: Summary of Mitigation Measures Proposed by GeM

Impact Area	Activity	Proposed Mitigation Measures
Groundwater Resources	Infiltration	Implement hazardous material and waste-handling procedures and secondary containment.
		Routinely monitor groundwater wells for contamination to confirm that changes in groundwater quality associated with the Proposed Action are minimal.
Surface Water Resources	Water use	Provide water necessary during construction via tanker truck from offsite potable water sources.
		Routinely monitor sitewide groundwater levels and continue to analyze the groundwater monitoring wells to confirm that changes in groundwater levels associated with the Proposed Action are minimal.
		Use low-water-consumption landscaping.
		Perform localized floor washing using mops and self-contained cleaning machines to reduce water usage compared to conventional washing techniques.
	Runoff	Implement a GMPEF stormwater management plan to mitigate a portion of the increased stormwaters from extreme storm events and all stormwater from smaller storm events.
		Limit cut/fill slopes to a horizontal-vertical ratio of 3:1 or less.
		Use silt fencing and covering of soil stockpiles to prevent sediment runoff.
		Suspend general construction activities during storms and impending precipitation.
		Construct drainage ditch crossings (i.e., installation of culverts) following at least 48 hours of dry weather.
		Maintain construction equipment so that equipment is in good repair and without visible leaks of oil, greases, or hydraulic fluids.
		Restore disturbed areas to original surface elevations, where possible.
		Routinely monitor and inspect stormwater management devices and systems to detect any issues so that appropriate corrective action can be taken promptly.
		Routinely monitor and inspect onsite liquid waste storage tanks and containers to detect any leaks or releases to the environment due to equipment malfunctions to ensure that actions according to the SPCC plan or other appropriate corrective action can be taken promptly.
		Perform visual inspections during unusual storm events so that appropriate corrective actions could be taken promptly, if needed.
Floodplains	Floodplain disturbance	Select a non-floodplain area for the proposed facility.
Ecological Resources	Disturbance of habitats	Minimize the construction footprint to the extent possible and limit habitat disruption.
		Restrict preconstruction activities and the harvesting of trees to periods when the ground is dry.
		If trenches are necessary, ensure that they are closed overnight; inspect trenches left open overnight and remove animals prior to backfilling. Place escape ramps in trenches at less than 45-degree angles to provide exit strategies for animals.
		Conduct site-stabilization practices to reduce the potential for erosion and sedimentation.
	Wetland disturbance	Direct impacts to wetlands that cannot be avoided could be compensated for by restoration, creation, enhancement, or preservation of wetlands similar to those impacted. In Kentucky, compensatory mitigation methods include restoration of a previously

Table 5-1: Summary of Mitigation Measures Proposed by GeM

Impact Area	Activity	Proposed Mitigation Measures
		existing wetland or other aquatic site, the establishment of a new aquatic site, enhancement of an existing aquatic site's functions, or preservation of an existing aquatic site. This may be accomplished through mitigation banks, in-lieu fee mitigation, and permittee-responsible compensatory mitigation.
Meteorology, Climatology, and Air Quality	Fugitive dust and construction emissions	Water the GMPEF Site and unpaved roads when dust emanates from these areas.
		Remove dirt from truck tires by driving over a gravel pad prior to leaving the GMPEF Site or unpaved access road to avoid spreading sediments on paved roads.
		Cover trucks carrying soil and debris to reduce dust emissions from the back of trucks driving on roadways.
		Pave access road and parking lots as soon as practicable.
		Implement speed limits for vehicles traveling on paved and unpaved roads.
	Facility operation emissions	Maintain process areas inside the operations building under continuous negative pressure relative to atmospheric pressure. In the event of a gaseous release in one of these process areas, the negative pressure conditions would prevent outflow of the air from the process areas, effectively containing the released gaseous material to the affected process area.
		Ventilate the enrichment buildings with a high-efficiency, multi-stage air emissions control system. Components of the air emissions control system would collect air pollutant releases within buildings, then route through a gaseous effluent ventilation system with pre-filters, high-efficiency gas adsorber, and high-efficiency particulate air filters to remove uranium compounds and HF from process gas streams. Exhaust gases from this emission-control system would be vented to the atmosphere through a stack for each module. These systems would be designed in accordance with NRC Regulatory Guide 1.140.
		Install and operate leak-detection monitors for process equipment. In the event a leak is detected due to an equipment component malfunction or other reason, safety interlocks will isolate the section of the process where the leak is detected, limiting the potential quantity of gaseous material that could be released inside the enrichment buildings.
		Implement a periodic inspection and maintenance program for UF_6 cylinders stored on outdoor cylinder storage pads.
		Store organic solvents, paints, and other volatile organic compound-containing liquids in containers covered with tightly fitting lids.
Noise	Exposure of workers and the public to noise	Prohibit heavy truck and earth-moving equipment usage after twilight and during early morning hours.
		Maintain construction equipment noise-control devices in effective operating condition.
		When possible, use quiet equipment or methods to minimize noise emissions.
		For equipment with internal combustion engines, operate equipment at the lowest operating speed to minimize noise, when possible and practical.
		Avoid equipment engine idling.
		Use quieter devices that comply with all applicable safety restrictions (e.g., OSHA standards) on back-up alarms for construction equipment.

Table 5-1: Summary of Mitigation Measures Proposed by GeM

Impact Area	Activity	Proposed Mitigation Measures
		Use a quieter, high-efficiency transformer to mitigate noise from the proposed electrical substation.
Historic and Cultural Resources	Disturbance of prehistoric archaeological sites eligible for listing on the NRHP	Follow internal procedural guidance for unexpected archaeological discoveries, including the unexpected discovery of human remains. The procedures include notification of certain State agency representatives, including the State Archaeologist.
Visual and Scenic Resources	Potential visual intrusions in the existing landscape character	Use exterior lighting that results in minimal light pollution and visibility from offsite areas.
		Use exterior building colors and landscaping that would soften the visual impact of the proposed facility.
Public and Occupational Health	Facility operation	Install a building ventilation system to maintain the majority of the interior of the process building under sub-atmospheric pressure.
		Install alarms in the Emergency Control Center to detect, alarm, and/or activate the automatic safe shutdown of process equipment in the event of operational problems.
		Isolate leaks and shut down process lines to prevent additional releases.
		Vent exhaust gases from the emission control system to the atmosphere through rooftop stacks.
		Install radiation monitors in effluent stacks to detect, alarm, and activate the automatic safe shutdown of process equipment, should contaminants be detected in the system exhaust.
		Conduct routine radiological surveys to characterize and minimize potential radiological exposure.
		Monitor all radiation workers via the use of dosimeters and area air sampling to ensure that radiological doses remain within regulatory limits.
		Conduct operations activities involving hazardous respirable effluents with ventilation control and/or respiratory protection, as required.
		Use personal protective equipment based on the nature of the work and chemical and/or radiological hazards present.
		Perform environmental monitoring and sampling to ensure compliance with regulatory discharge limits.
	Accident prevention and consequence management	Incorporate the following features into facility design to mitigate fire and explosion accidents: • Fire alarm and detection systems, including suppression capability • Fire barriers to prevent propagation of fire in and out of areas containing uranium material • System and component design features that isolate combustible material and/or shut down affected systems • Structural design features that withstand peak explosive blast loads and prevent or minimize the propagation of structural debris into UF_6 process or handling areas • Limit combustibles in and near outside areas where cylinders are stored

Table 5-1: Summary of Mitigation Measures Proposed by GeM

Impact Area	Activity	Proposed Mitigation Measures
Waste Management	Generation of hazardous, radiological, and mixed wastes (air emissions are addressed under Air Quality and liquid emissions are addressed under Groundwater and Surface Water Resources)	Minimize the quantities of waste generated by the proposed facility.
		Monitor and inspect onsite liquid waste storage tanks and containers on a periodic schedule to detect leaks or releases to the environment due to equipment malfunctions so that actions identified in the SPCC plan or other appropriate corrective action can be taken promptly.
		Minimize onsite storage volumes and times and ship waste destined for offsite treatment and disposal facilities as soon as practicable.
		Avoid and minimize potential hazardous and radiological waste impacts from the UF_6 cylinder storage pads by implementing design elements and safety procedures during operation, including: • Using a storage array that permits easy visual inspection (stacked no more than two cylinders high) • Segregating storage pad areas from the rest of the enrichment facility by concrete barriers • Inspecting cylinders for external contamination (i.e., a "wipe test") prior to placing on the storage pads or transporting them off site • Ensuring that UF_6 cylinders are not equipped with defective valves • Allowing only designated vehicles with a limited amount of fuel in the storage pad area or using electric vehicles • Allowing only trained and qualified personnel to operate vehicles in the storage pad area
		Inspect cylinders of UF_6 initially prior to placing them on a storage pad and, thereafter, inspect periodically for damage or surface coating defects. Inspection criteria would include ensuring the following: • Lifting points are free from distortion and cracking • Cylinder skirts and stiffener rings are free from distortion and cracking • Cylinder surfaces are free from bulges, dents, gouges, cracks, or significant corrosion • Cylinder valves are fitted with the correct protector and cap • Cylinder valves are straight and not distorted, two to six threads are visible, and the square head of the valve stem is undamaged • Cylinder plugs are undamaged and not leaking
		If inspections of a cylinder reveal significant deterioration or other conditions that may affect its safe use, transfer the contents of the cylinder to another cylinder and discard the defective cylinder. Investigate the cause of any significant deterioration, and if necessary, perform additional inspection of cylinders.

Key: GeM = General Matter, Inc.; GMPEF = General Matter Paducah Enrichment Facility; HF = hydrogen fluoride; OSHA = Occupational Safety and Health Administration; NRHP = National Register of Historic Places; ROW = rights-of-way; SPCC = Spill Prevention Control and Countermeasure; UF_6 = uranium hexafluoride

5.1 Land Use

Given that the GMPEF would be constructed and operated on land that is within the United States (U.S.) Department of Energy (DOE) Paducah Site and is currently zoned Heavy Industry and given that the farmland conversion rating would be below the mitigation threshold, the land use impacts of the GMPEF

would be SMALL. The measures that could be considered for incorporation in the GMPEF design and layout to minimize land use impacts include the following:

- Use of existing utility rights-of-way and existing roads to the fullest extent practicable to minimize the need for additional ground disturbance
- Use of existing utilities infrastructure to the fullest extent practicable to reduce the need for new construction of utility lines.

5.2 Transportation

There would be incremental increases in truck and automobile traffic on major roadways in the vicinity of the Paducah Site as a result of the Proposed Action. These increases are expected to have a MODERATE impact on local traffic volumes and patterns on Kentucky (KY) Route 1154 (Hobbs Road) in the vicinity of the intersection with U.S. Highway (U.S. Hwy) 60 during the construction phase. Regionally, impacts to roadways in the vicinity of the GMPEF would be SMALL. Examples of measures that would be used, or could be considered, to mitigate motor vehicle traffic impacts on KY 1154 (Hobbs Road) in the vicinity of the intersection with U.S. Hwy 60 and connecting roadways include the following:

- Coordinate with KY Department of Transportation and McCracken County to construct roadway improvements and optimize signal timings at the signalized intersection of U.S. Hwy 60 and KY 1154 (Hobbs Road) to Hobbs Road to improve traffic flow and minimize congestion during peak traffic hours.
- Schedule GMPEF operations worker shift changes and truck shipments for off-peak traffic periods, when practical.
- Monitor transportation worker radiation dose to maintain it within regulatory limits.

5.3 Geology and Soils

During construction, a short-term increase in soil erosion would occur. These SMALL impacts would be mitigated by following best management practices (BMPs) to control soil erosion, as specified in the Kentucky Energy and Environment Cabinet (KEEC), *Erosion Prevention and Sediment Control Guide* (KEEC, 2004). BMPs would be based on the basic principles for erosion prevention, which include the following:

- Preserve existing vegetation to the extent practical.
- Divert upland runoff around exposed soil.
- Seed/mulch/cover bare soil immediately, or as quickly as practicable.
- Use sediment barriers to trap soil in runoff.
- Protect slopes and channels from gullying.
- Install sediment traps.

BMPs could include, but would not be limited to, the following:

- Engineering design plans that minimize soil disturbance during construction activities.
- Using soils from onsite areas, if such additional soil is necessary for construction purposes.
- Using adequate containment methods during excavation and/or similar operations.
- Using site-stabilization practices (i.e., placing crushed stone on top of disturbed soil in areas of concentrated runoff).
- Using silt berms, dikes, and sediment fences.

- Stabilizing drainage culverts and ditches by lining surface with rock aggregate/riprap to reduce flow velocity and prohibit scouring.
- Reusing and/or appropriately placing excavated materials to decrease exposed soil piles.
- Placing gravel construction pads at the entrances/exits of construction areas.
- Conducting vehicle decontamination prior to demobilization.

Additional discussion of erosion and sedimentation control measures is provided in Section 5.4.2, *Surface Waters*. After construction is complete, the GMPEF Site would be stabilized with low-maintenance landscaping and pavement.

Geological resources that may exert an impact on the Proposed Action (e.g., potential response of deeper subsurface unconsolidated deposits to regional seismic events) were evaluated in Section 4.4, *Geology and Soils Impacts*. Potential impacts from geological conditions on the GMPEF are expected to be SMALL and would be limited within the GMPEF Site. Control of the liquefaction potential may be completed through engineering methods, such as soil remediation. Other similar engineering methods may be investigated based on the final subsurface investigation and final site design.

5.4 Water Resources

5.4.1 Groundwater

As stated in Section 4.5, *Water Resource Impacts*, no adverse subsidence or groundwater quantity impacts are anticipated during construction, operations, or decommissioning of the GMPEF. Impacts to groundwater are anticipated to be SMALL and most likely would be due to the potential for accidental release of hazardous constituents. These impacts would be mitigated through implementation of proper hazardous material and waste handling procedures and secondary containment, site inspections, and employee training, as required by applicable laws and regulations and BMPs. If mitigation measures above and beyond those required by regulations are identified, they would be developed and documented prior to implementation.

Groundwater levels are not anticipated to change due to the Proposed Action. The GMPEF would obtain water from a local water supplier such as the DOE Paducah Site or Paducah Water Works. Onsite monitoring wells would remain in place for periodic monitoring to ensure potential impacts associated with the Proposed Action remain SMALL.

5.4.2 Surface Waters

Construction of the GMPEF would require filling of some onsite wetlands areas. Anticipated direct impacts to existing surface waters would therefore be SMALL due to filling of the wetlands. Indirect impacts to receiving waters, such as increased sediment and stormwater runoff, could occur during construction. These impacts are anticipated to be SMALL and would be prevented or minimized through following proper construction BMPs as described in the KEEC *Best Management Practices (BMPs) for Controlling Erosion, Sediment, and Pollutant Runoff from Construction Sites* (GLE, 2025; KEEC, 2009). Impacts that could not be avoided during construction could be minimized through measures such as:

- Constructing access roads perpendicular to drainage ditches to minimize the area impacted.
- Limiting cut/fill slopes to a horizontal-vertical ratio of three to one or less.
- Using silt fencing and covering of soil stockpiles to prevent sediment runoff.
- Suspending general construction activities during storms and impending precipitation.
- Constructing drainage ditches crossings (i.e., installation of culverts) following at least 48 hours of dry weather.

- Maintaining construction equipment so that equipment is in good repair and without visible leaks of oil, grease, or hydraulic fluids.
- Restoring disturbed areas to original surface elevations, where possible.

Impacts to surface waters during GMPEF operation due to stormwater runoff would be SMALL. GeM will obtain Kentucky Pollutant Discharge Elimination System permit coverage for two additional outfalls to Bayou Creek and Little Bayou Creek (see Figure A-6). Stormwater runoff would then be conveyed to the new permitted outfalls. New outfalls will be constructed during the construction phase of the Proposed Action activities. GeM plans to submit permit applications for the new outfalls to the Kentucky Department of Environmental Protection by the end of 2026. In addition, BMPs would be employed to minimize any impacts to surface waters due to operation of the GMPEF. Mitigation measures to minimize any impacts could include, but are not limited to, the following:

- Monitoring and inspecting stormwater management devices and systems to detect any issues so that appropriate corrective action can be taken promptly.
- Performing visual inspections during unusual storm events so that appropriate corrective actions could be taken promptly if needed.
- Engineering controls on stormwater detention basins that allow water to be held on site and tested prior to discharging to outfalls, in the event of a suspected release.

Impacts during decommissioning would be mitigated as required by mitigation measures similar to those described for construction. Any contaminated solutions generated from decontamination activities would be contained for appropriate management at offsite facilities.

5.4.3 Floodplains

Impacts to the floodplain boundary from the Proposed Action would be SMALL. The entirety of the GMPEF Site (Parcel A and the proposed switchyard area within Parcel C) is outside the boundaries of nearby floodplains; therefore, no rise to the 100-year floodwaters is anticipated. No modifications to the boundaries of the floodplains are anticipated during construction, operation, or decommissioning of the GMPEF. Minor changes in floodwater volume and flow during extreme storm events are anticipated; however, increases in floodwater volumes and flow would be mitigated through implementation of the DOE Paducah stormwater management system and the addition of newly permitted outfalls into which the stormwater would discharge. These measures are discussed in Section 5.4.2, *Surface Waters*.

5.4.4 Water Use

Impacts to regional groundwater due to construction, operation, and decommissioning of the GMPEF are anticipated to be SMALL. Additionally, no impacts are anticipated to surface water users (e.g., fishing, navigation, drinking). No water resources from onsite surface waters or groundwater are anticipated to be withdrawn for construction, operation, or decommissioning of the GMPEF. Impacts to water use due to the GMPEF are expected to be SMALL. Although impacts are anticipated to be SMALL, impacts could be further mitigated through water conservation measures. These measures often make financial sense for the proponent and would be considered by GeM in future facility design and management.

5.5 Ecological Resources

The Proposed Action would result in MODERATE impacts to existing vegetation and MODERATE impacts to wildlife; however, no Federal- or State-listed special status species would be adversely affected by the Proposed Action. Development of the GMPEF in combination with the projects planned for the foreseeable future on and surrounding the GMPEF Project Area (as described in Section 2.4, *Cumulative Effects*), could result in LARGE impacts to vegetation. Mitigation measures would be in place to minimize

the potential impacts on ecological resources. In addition to BMPs listed in Section 5.4.2, *Surface Waters*, potential ecological resources mitigation measures could include, but are not limited to:

- Removing trees outside of the roost season for all federally protected bat species, generally between October 1 and March 31.
- Using low-impact warm-toned, low-intensity, and directional outdoor facility lighting and avoiding where possible unnecessary illumination when constructing and operating the GMPEF.
- Excluding vegetation clearing during migratory bird nesting season, generally occurring between March through August.
- Closing trenches overnight, if used during construction; inspecting trenches that are left open overnight and removing animals prior to backfilling; placing escape ramps at less than 45-degree angles in trenches to provide exit strategies for animals entering the trenches.
- The current site plan assumes minimal landscaping, but should landscaping be needed, use native species for plantings to ensure invasive species management and weed control efforts.

The following existing programs could be expanded to enhance wildlife habitat on the GMPEF Project Area:

- Conducting site-stabilization practices to reduce the potential for erosion and sedimentation.

In addition to the proposed management practices listed above, recommendations of appropriate State and Federal agencies, including the U.S. Fish and Wildlife Service and Kentucky Department of Fish and Wildlife Resources, would be considered.

5.5.1 Wetlands

Construction of the GMPEF would cause direct and permanent impacts to wetlands that are expected to be SMALL to MODERATE. As part of previous rough-grading activities, all existing wetland habitat (declared non-Waters of the United States [WOTUS]) within the Parcel A 100-acre GMPEF Site was converted to pervious and impervious areas, and increased stormwater runoff volumes are expected. Indirect impacts to offsite wetland habitats due to increased runoff from the GMPEF during construction and operation are expected to be SMALL. For impacts to jurisdictional waters within Parcel C (within the 6.8-acre proposed switchyard area), GeM will submit either an application for a Section 404 Nation-wide Permit or an Individual Permit (for significant impacts) to the U.S. Army Corps of Engineers Louisville District office. A 404 Nationwide or Individual Permit will be obtained prior to construction. GeM will coordinate with the Kentucky Division of Water office to obtain 401 Water Quality Certification. Final direct and indirect impacts would be determined based on the final engineering design, and applicable permits would be obtained prior to construction. Mitigation for impacts to WOTUS features would include mitigation banks, permittee-responsible mitigation, and/or in-lieu fee programs.

Upon completion of construction of the GMPEF, neither operation nor decommissioning of the facility is anticipated to result in additional adverse impacts to wetlands.

5.6 Air Quality

As concluded in Section 4.7, *Air Quality*, air quality impacts from construction, operation, and decommissioning of the Proposed Action would be SMALL. Incorporation of air emissions control systems into the GMPEF design and the implementation of planned mitigation measures would reduce the levels of air emissions released on site.

Potential measures that would mitigate fugitive dust emissions during construction of the GMPEF include the following:

- Watering the GMPEF Site and unpaved roads when dust emanates from these areas.
- Implementing speed limits for vehicles traveling on paved and unpaved roads.
- Removing dirt from truck tires by driving over a gravel pad prior to leaving the GMPEF Site or unpaved access road to avoid spreading sediments on paved roads.
- Covering trucks carrying soil and debris to reduce dust emissions while driving on roadways.
- Paving access road and parking lots as soon as practicable.

Control systems and mitigation measures planned for operations of the GMPEF that would lessen the release of air emissions to the atmosphere include:

- Maintaining process areas inside the GMPEF enrichment buildings under continuous negative pressure relative to atmospheric pressure, which would prevent the outflow of unfiltered air in the event of a gaseous release in one of the process areas, effectively containing the released gaseous material.
- Ventilating the enrichment buildings with a high-efficiency, multi-stage air emissions control system. Components of the air emissions control system would collect air pollutant releases within buildings, then route through a gaseous effluent ventilation system with pre-filters, high efficiency gas adsorber, and high efficiency particulate air filters to remove uranium compounds and hydrogen fluoride from process gas streams. Exhaust gases from this emission-control system would be vented to the atmosphere through a stack for each module. These systems would be designed in accordance with U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide 1.140.
- Implementing a periodic inspection and maintenance program for uranium hexafluoride (UF_6) cylinders stored on outdoor cylinder storage pads.
- Storing organic solvents, paints, and other volatile organic compound-containing liquids in containers covered with tightly fitting lids.

5.7 Noise and Vibration

Construction would result in SMALL noise and vibration impacts to nearby receptors. Heavy truck and earth-moving equipment usage would be limited to daylight hours. Work would typically not be planned on holidays. Noise-suppression systems on construction vehicles would be kept in proper operation. Noise levels would remain below NRC criteria levels and vibrations would be imperceptible at the closest sensitive locations. Although noise and vibration impacts associated with construction would be SMALL, mitigation options are proposed to further reduce potential impacts. Examples of various mitigation options that would be considered for application by the contractor include:

- Equipping construction equipment with the manufacturer's noise-control devices and maintaining these devices in effective operating conditions.
- When possible, utilizing quiet equipment or methods to minimize noise.
- For equipment with internal combustion engines, operating equipment at the lowest operating speed to minimize noise when possible and practical.
- Avoiding equipment engine idling.
- Utilizing quieter devices that comply with all applicable safety restrictions (e.g., Occupational Safety and Health Administration [OSHA] standards) on back-up alarms for construction equipment.
- Utilizing sound barriers.

During operation of the GMPEF, most noise and vibration would occur inside the GMPEF and impacts would therefore be SMALL. The expected noise levels during decommissioning would be similar to those during the construction or operating phase, and therefore, would have a SMALL noise and vibration impact and mitigation is not needed.

5.8 Historical and Cultural Resources

Activities restrictions, limitations, and mitigation measures are put in place to protect cultural resources. The existing cultural resources within the Area of Potential Effect (APE), were analyzed for condition and evaluated to determine the effects of the Proposed Action on the existing resources.

There are no historic properties listed on or recommended for inclusion in the National Register of Historic Places within the physical APE. Therefore, the Proposed Action will have no impact to historic properties and mitigation is not needed.

5.9 Visual/Scenic Resources

Visual/scenic resource impacts resulting from the GMPEF would be mitigated by measures that would be incorporated into the final facility design, including:

- Using exterior building colors and landscaping that would soften the visual impact of the GMPEF.
- Following construction, restoring all disturbed areas not used for permanent facilities to vegetated landscaping.
- Using exterior lighting that results in minimal light pollution and visibility from offsite areas.

5.10 Socioeconomic

Overall population, economic, and social adverse impacts from the Proposed Action are anticipated to be SMALL to MODERATE, even though individual impacts on housing, educational, medical, law enforcement, and fire and rescue services may vary. No socioeconomic mitigation measures are anticipated to be necessary.

5.11 Public Health

Human health impacts to nearby residents or onsite workers due to exposures from permitted chemical emissions and radiological exposures from the Proposed Action are anticipated to be SMALL. An essential component of GeM's strategy to avoid human health impacts is to control and minimize potential exposures to workers and the public through BMPs and As Low As Reasonably Achievable (ALARA) practices. Mitigation measures would be in place to minimize the release of nonradiological and radiological effluents, such that their levels would be well below regulatory limits. These mitigation measures include:

- Installing a building ventilation system to maintain the process portion of the enrichment buildings under negative (sub-atmospheric) pressure.
- Venting exhaust gases from the emission control system to the atmosphere through filtered, monitored rooftop stacks.
- Installing alarms and control systems to detect, and alarm, off-normal or faulted conditions such that mitigation and/or protective actions are taken in the event of operational problems.
- Installing radiation monitors in the effluent stacks to detect and alarm off-normal or faulted conditions such that mitigation and/or protection actions are taken should contaminants be detected in system exhaust.

- Maintaining an effective Emergency Plan at the GMPEF including onsite resources available to respond to and mitigate the unintended release of nonradiological and radiological effluents.
- Programmatic controls that prohibit storage of empty "heels" cylinders along the fence line adjacent to the cylinder storage pads as these are estimated to emit the highest dose.
- Limiting the amount of UF_6 in the liquid phase; this design optimization reduces the likelihood of onsite and offsite consequences from a cylinder breach accident because liquid UF_6 is more likely to disperse than UF_6 in solid form.

Worker health and safety would be protected by the Site Nuclear Safety Program and the Industrial Hygiene Safety Program. These programs comply with all applicable state, NRC (10 *Code of Federal Regulations* (CFR) 20, *Standards for Protections Against Radiation*), and OSHA (29 CFR 1910, *Occupational Safety and Health Standards*) requirements and include:

- Compliance with the Site Radiation Protection Program.
- Compliance with the Spill Prevention Control and Countermeasure plan.
- Compliance with the GMPEF Environmental, Health, and Safety Program, in accordance with OSHA industrial regulations.
- Routine plant radiation and radiological surveying to characterize and minimize potential radiological exposure.
- Monitoring of all radiation workers through the use of dosimeters and area air sampling to ensure that radiological doses remain within regulatory limits and ALARA practices.
- Conducting operations activities involving hazardous respirable effluents with ventilation control and/or respiratory protection, as required.
- Utilizing personal protective equipment based on the nature of the work and chemical and/or radiological hazards present.

5.12 Waste Management

The GMPEF would generate wastewaters and solid wastes that would require management. Impacts from the management of these wastes would be SMALL to MODERATE.

Waste management impacts resulting from the GMPEF would be controlled by implementing a comprehensive program that incorporates the following wastewater and solid waste management impact mitigation measures:

- Minimizing the quantities of waste generated.
- Monitoring and inspecting onsite liquid waste storage tanks and containers on a periodic schedule to detect leaks or releases to the environment due to equipment malfunctions so that actions identified in the Spill Prevention Control and Countermeasure plan or other appropriate corrective action can be taken promptly.
- Avoiding and minimizing potential hazardous and radiological waste impacts from the UF6 cylinder storage pads by implementing the following administrative controls and safety procedures during operation of the GMPEF:
  - Using a storage array that permits easy visual inspection of UF_6 cylinders.
  - Segregating the cylinder storage pads from the rest of the GMPEF by concrete barriers or fencing.

- Inspecting UF_6 cylinders for external contamination (i.e., a "wipe test") prior to placement on cylinder storage pads or transportation off site.
- Allowing only designated vehicles with a limited quantity of fuel in the cylinder storage pads area or use electric vehicles.
- Allowing only trained and qualified personnel to operate vehicles in the cylinder storage pads area.
- Inspecting UF_6 cylinders prior to placing them on a storage pad and, thereafter, periodically inspecting for damage or surface coating defects. Inspection criteria would include ensuring the following:
  - Lifting points are free from distortion and cracking.
  - Cylinder skirts and stiffener rings are free from distortion and cracking.
  - Cylinder surfaces are free from bulges, dents, gouges, cracks, or significant corrosion.
  - Cylinder valves are fitted with the correct protector and cap.
  - Cylinder valves are straight and not distorted, two to six threads are visible, and the square head of the valve stem is undamaged.
  - Cylinder plugs are undamaged and not leaking.
  - If inspections of a UF_6 cylinder reveal significant deterioration or other conditions that may affect its safe use, the contents of the cylinder would be transferred to another cylinder and the defective cylinder would be discarded. The cause of any significant deterioration would be investigated, and if necessary, additional inspection of cylinders would be made.

6.0 ENVIRONMENTAL MEASUREMENTS AND MONITORING PROGRAMS

In accordance with the Radiation Protection regulations in 10 *Code of Federal Regulations* (CFR) 20 (*Standards for Protection Against Radiation*), the United States (U.S.) Nuclear Regulatory Commission (NRC) requires that licensees perform the measurements and monitoring necessary to demonstrate compliance with these regulations. In addition, pursuant to 10 CFR 70.59 (*Effluent Monitoring Reporting Requirements [Domestic Licensing of Special Nuclear Material]*), the NRC requires that licensees submit semiannual reports specifying the quantities of the principal radionuclides released to unrestricted areas and other information needed to estimate the annual radiation dose to the public from effluent discharges. The NRC has also issued Regulatory Guide (RG) 4.15, Quality Assurance for Radiological Monitoring Programs (INCEPTION THROUGH NORMAL OPERATIONS TO LICENSE TERMINATION) – Effluent Streams and the Environment (NRC, 2007), and RG 4.16, Monitoring and Reporting Radioactivity in Releases of Radioactive Materials in Liquid and Gaseous Effluent from Nuclear Fuel Processing and Fabrication Plants and Uranium Hexafluoride Production Plants (NRC, 2010), to protect public health and safety.

The General Matter Paducah Enrichment Facility (GMPEF) Environmental Monitoring Program would include monitoring at the points of release from control systems. Airborne emissions would be sampled in exhaust stacks, liquids would be sampled prior to or at outfalls, and groundwater would be sampled near the perimeter of the GMPEF. The GMPEF Environmental Monitoring Program would be revised as appropriate to reflect changes in operations and/or regulatory requirements and permits.

The GMPEF Environmental Monitoring Program Plan will detail the collection of representative samples; use of appropriate sampling methods and equipment; proper locations for sampling points; and proper handling, storage, transport, and analyses of effluent samples. In addition, written procedures would direct the proper maintenance and calibration of sampling and measuring equipment. Employees involved in implementation of this program will be trained in the program procedures.

The GMPEF Environmental Monitoring Program and associated plan would be revised as appropriate to maintain its effectiveness as changes are noted, such as those related to (1) operations, (2) emergence of newly found information, or (3) regulatory agency permits and other authorizations. Trending and action levels for monitored environmental parameters would be included in documented procedures as appropriate. Such trending and action levels would provide guidance to assure compliance within appropriate regulatory limits and would be consulted on an ongoing basis to initiate internal review and adjustments of operations and other procedures.

See Table 6-1 for a summary of the planned GMPEF Environmental Monitoring Program. Typical analytical minimum detectable concentrations are listed in Table 6-2.

Table 6-1: Summary of Planned GMPEF Environmental Monitoring Program

Medium	Sample Locations [a]	Sample Type	Analyte/Parameter-Frequency [b]
Direct radiation	Personnel dosimetry	Continuous film badges, TLDs, and pocket dosimeters	Gamma and neutron activity
	UF_6 storage pads and other outdoor storage areas and ambient (background) [c]	Continuous film badges or TLDs	Gamma and neutron activity
Air	Main GMPEF operations building stacks	Continuous air particulate filter	Gross alpha activity – Weekly Fluoride – Weekly
	GMPEF controlled access area fence line and ambient (background) [c]	Continuous air particulate filter	Gross alpha activity – Weekly Uranium isotopes – Weekly
Treated process wastewater effluent	Outfall locations	Continuous proportional sample of liquid effluent	Total uranium – Daily composite Gross alpha/beta activities – Weekly composite Tc-99 – Quarterly composite [d] KPDES permit requirements
Treated sanitary wastewater effluent [e]	At outlet of sanitary wastewater treatment system.	Continuous metering of flow volume	Biological oxygen demand (five a day) – Twice monthly Total suspended solids – Twice monthly KPDES permit requirements
Groundwater	TBD [f]	Grab sample	Total uranium – Quarterly Gross alpha/beta activities – Only if total uranium concentration in previous sample >0.02 mg/L Fluoride – Quarterly
Stormwater	Stormwater retention basin	Stormwater grab samples	KPDES permit requirements
	UF_6 storage pads retention basin	Grab sample	Gross alpha/beta activities – Before transfer of held water to stormwater retention basin Total uranium – Before transfer of held water to stormwater retention basin Fluoride – Before transfer of held water to stormwater retention basin
Soil	TBD [f]	Shallow soil sample	Total uranium – Semi-annual
Sediment	KPDES permitted outfall locations	Sediment grab sample	Total uranium – Semi-annual

Table 6-1: Summary of Planned GMPEF Environmental Monitoring Program

Medium	Sample Locations [a]	Sample Type	Analyte/Parameter-Frequency [b]

Key: > = greater than; DOE = United States Department of Energy; GeM = General Matter, Inc.; GMPEF = General Matter Paducah Enrichment Facility; KPDES = Kentucky Pollutant Discharge Elimination Systems; mg/L = milligrams per liter; TBD = to be determined; TC-99 = technetium-99; TLDs = thermoluminescent dosimeters; UF_6 = uranium hexafluoride

Notes:

[a] All sample locations are in addition to sampling already conducted by or on behalf of DOE in the area.

[b] Initial monitoring frequencies may be evaluated and adjusted.

[c] Propose the use of the DOE Paducah ambient (background) monitoring information.

[d] No Tc-99 expected but initial testing planned as a precaution.

[e] Treated sanitary wastewater effluent would be discharged into the DOE sewer system, and sampling would fall under DOE's responsibilities.

[f] Finalized locations will be submitted as part of GeM's environmental monitoring plan.

Table 6-2: Typical Analytical Minimum Detectable Concentrations

Medium	Analyte	Typical MDC
Air (particulate filter) – Stack	Gross alpha activity	1.0×10^{-12} µCi/mL
Air (particulate filter) – At access area fence line, and ambient (background)	Gross alpha activity	5.0×10^{-16} µCi/mL
	Uranium isotopes	4.0×10^{-18} to 5.0×10^{-18} µCi/mL (MDC dependent on actual average weekly flow rate, which may vary between 150–190 scfph [70–90 sL/min])
Treated process wastewater effluent	Total uranium	0.02 ppm
	Gross alpha activity	3.0×10^{-8} µCi/mL
	Gross beta activity	5.0×10^{-8} µCi/mL
	Technetium-99	2.0×10^{-8} µCi/mL
Groundwater	Total uranium	0.02 ppm
	Gross alpha activity	20 pCi/L
	Gross beta activity	5 pCi/L
Stormwater – UF_6 cylinder storage pad retention basin	Total uranium	0.02 ppm
	Gross alpha activity	20 pCi/L
	Gross beta activity	5 pCi/L
Soil	Total Uranium	0.02 ppm
Sediment	Total Uranium	0.02 ppm

Key: MDC = minimum detectable concentration; pCi/L = picocuries per liter; ppm = parts per million; scfph = standard cubic feet per hour; sL/min = standard liters per minute; µCi/mL = microcuries per milliliter ; UF_6 = uranium hexafluoride

The GMPEF Environmental Monitoring Program would be revised as appropriate to maintain its effectiveness as changes are noted, such as those related to (1) operations, (2) emergence of newly found information, or (3) regulatory agency permits and other authorizations. Action levels for monitored environmental parameters would be included in documented procedures as appropriate. Such action levels would provide guidance to assure compliance within appropriate regulatory limits and would be consulted on an ongoing basis to initiate internal review and adjustments of operations and other procedures.

The GMPEF Environmental Monitoring Program would fall under the oversight of the GMPEF quality assurance program; therefore, it would be formally audited and assessed to ensure effectiveness. Written procedures would detail the collection of representative samples; use of appropriate sampling methods and equipment; proper locations for sampling points; and proper handling, storage, transport, and analyses of effluent samples. In addition, written procedures would direct the proper maintenance and calibration of sampling and measuring equipment, including ancillary equipment such as airflow meters. Moreover, GMPEF Environmental Monitoring Program procedures would include functional testing and routine checks to demonstrate that monitoring and measuring instruments are in working condition. Employees involved in implementation of this program would be trained in the program procedures.

Quality control procedures used by the laboratories performing environmental analyses would be adequate to validate the analytical results. These quality control procedures would include the use of established standards, such as those provided by the National Institute of Standards and Technology, as well as standard analytical procedures, such as those established by the National Environmental Laboratory Accreditation Conference. Monitoring and sampling activities, laboratory analyses, and reporting of GMPEF-related radioactivity in the environment would be conducted in accordance with industry-accepted and regulatory-approved methodologies.

6.1 Radiological Monitoring

Operational monitoring is addressed in Section 6.1.1, *Direct Radiation Monitoring*, through Section 6.1.8, *Kentucky Surveillance Program Description*. It is anticipated that the GMPEF Environmental Monitoring Program would remain operational during the life of the GMPEF and the majority of the decommissioning phase. As decommissioning progresses, monitoring points may be phased out as contamination sources are removed. A comprehensive Decommissioning Plan, including monitoring information, would be prepared and approved by the appropriate regulatory agencies prior to the commencement of decommissioning. Radiation monitoring during construction is discussed in Section 6.1.9, *Direct Radiation Monitoring During Construction*.

6.1.1 Direct Radiation Monitoring

Personnel dosimetry would be used to evaluate the radiation dose to GMPEF workers. An estimation of dose provides a means of complying with Kentucky Administrative Regulation (KAR), 902 KAR 100:019, *Standards for Protection Against Radiation* and the Radiation Protection requirements in 10 CFR 20, including keeping doses As Low as Reasonably Achievable (ALARA).

Radiation Safety Analyses, also referred to as ALARA reviews, would be completed prior to posting radiation safety requirements for individual work areas. Results from the Radiation Safety Analyses determine what type of personal protection equipment (PPE) and dosimetry would be required for normal operations, maintenance, or other types of work activities. Examples of personnel dosimetry that might be required in specific work areas include film badges, thermoluminescent dosimeters, and pocket dosimeters.

Direct radiation monitoring for the cylinder storage pads and other outdoor storage areas would be accomplished using film badges, thermoluminescent dosimeters, or electronically alarming dosimeters. Periodic surveys, which would be required by the Radiation Protection Program, would also be performed in and around outdoor storage areas to ensure that direct radiation doses are maintained ALARA.

6.1.2 Air Monitoring

Air emission control systems would be designed and operated to assure compliance with regulatory requirements. Operations that could potentially exhaust radioactive materials and hazardous air pollutants (HAPs) would have air emission controls that would be monitored by representative stack sampling to demonstrate compliance with regulations. Samples would be collected and analyzed to be representative of the discharges during production operations. Adequate monitoring would be conducted such that General Matter, Inc. (GeM) could take necessary protective actions that may be needed for process upsets or unforeseen circumstances.

The primary source of air emissions from the GMPEF would be from the stacks on the uranium enrichment buildings (shown on Figure 6-1). A total of nine stacks is currently planned. They would be located on the outside of the uranium enrichment buildings, approximately 72 feet tall with diameters of one 36-inch stack and eight 20-inch stacks, with a respective exit velocity of approximately 3,000 feet per minute (15.24 meters per second). These dimensions are subject to change to ensure current designs are in compliance with regulations. Each stack would include a Gaseous Effluent Ventilation System to remove uranium compounds and hydrogen fluoride from process gas streams. Each stack would be monitored continuously to measure airflow, hydrogen fluoride, and radioactivity of the exhaust air. Each stack would be filtered with a prefilter, a high-efficiency gas adsorber carbon filter, and double high-efficiency particulate air filter. The stacks would comply with NRC Regulatory Guides 4.16 and 1.140, and radioactive air emissions would not exceed emissions standard of 10 millirem per year.

In addition to stack monitoring, air monitoring for radioactive emissions would take place in proximity to the GMPEF. Air monitors along the site's fence line would be used for analysis of a weekly composite sample for gross alpha activity and concentrations of uranium isotopes. The monitors would be placed around the controlled access area fence line of the GMPEF.

Air monitoring of the background levels of radioactive materials in the atmosphere would also be performed. The U.S. Department of Energy (DOE) maintains an air monitor approximately 9 miles to the south-southwest of the GMPEF stacks. GeM would either place an independent air monitor in a similar location or reach an agreement with DOE to use their Air Monitoring Data Base and Control Point monitor for ambient data.

6.1.3 Wastewater Effluent and Surface Water Monitoring

Radioactive liquid waste handling in the GMPEF would consist of a Liquid Effluent Collection System. Liquid waste streams would be collected in this system and sent to permitted offsite facilities for treatment and disposal.

GeM will obtain Kentucky Pollutant Discharge Elimination System (KPDES) permit coverage for two additional outfalls to Bayou Creek and Little Bayou Creek (see Figure A-6). Stormwater runoff would then be conveyed to new permitted outfalls. New outfalls will be constructed during the construction phase of the Proposed Action activities. GeM plans to submit permit applications for the new outfalls to the Kentucky Department of Environmental Protection by the end of 2026. No process or cooling water will be discharged to the DOE C-615 treatment plant system. Cooling water will be treated and then discharged to Bayou or Little Bayou.

6.1.4 Groundwater Monitoring

The current DOE Paducah Site radiological groundwater monitoring program includes analysis of samples from a large number of wells across the Paducah Site and surrounding area (shown on Figure 6-2). However, since all these wells are anticipated to be downstream of the GMPEF, additional monitoring well locations will be constructed around the GMPEF and added to the sampling protocol as part of the GMPEF Radiological Monitoring Program.

6.1.5 Soil Monitoring

Soil samples will be collected on a semi-annual basis from locations (shown on Figure 6-3) that were established considering the approximate location of the GMPEF stacks, the prevailing wind directions, and the surrounding residences. Soil samples would be collected using decontaminated hand-sampling tools from the upper 4 inches and would be analyzed for uranium concentrations. Semi-annual sampling of soil at the sampling locations would begin prior to commencement of GMPEF operation to establish baseline conditions, and the monitoring program would continue throughout operation and decommissioning.

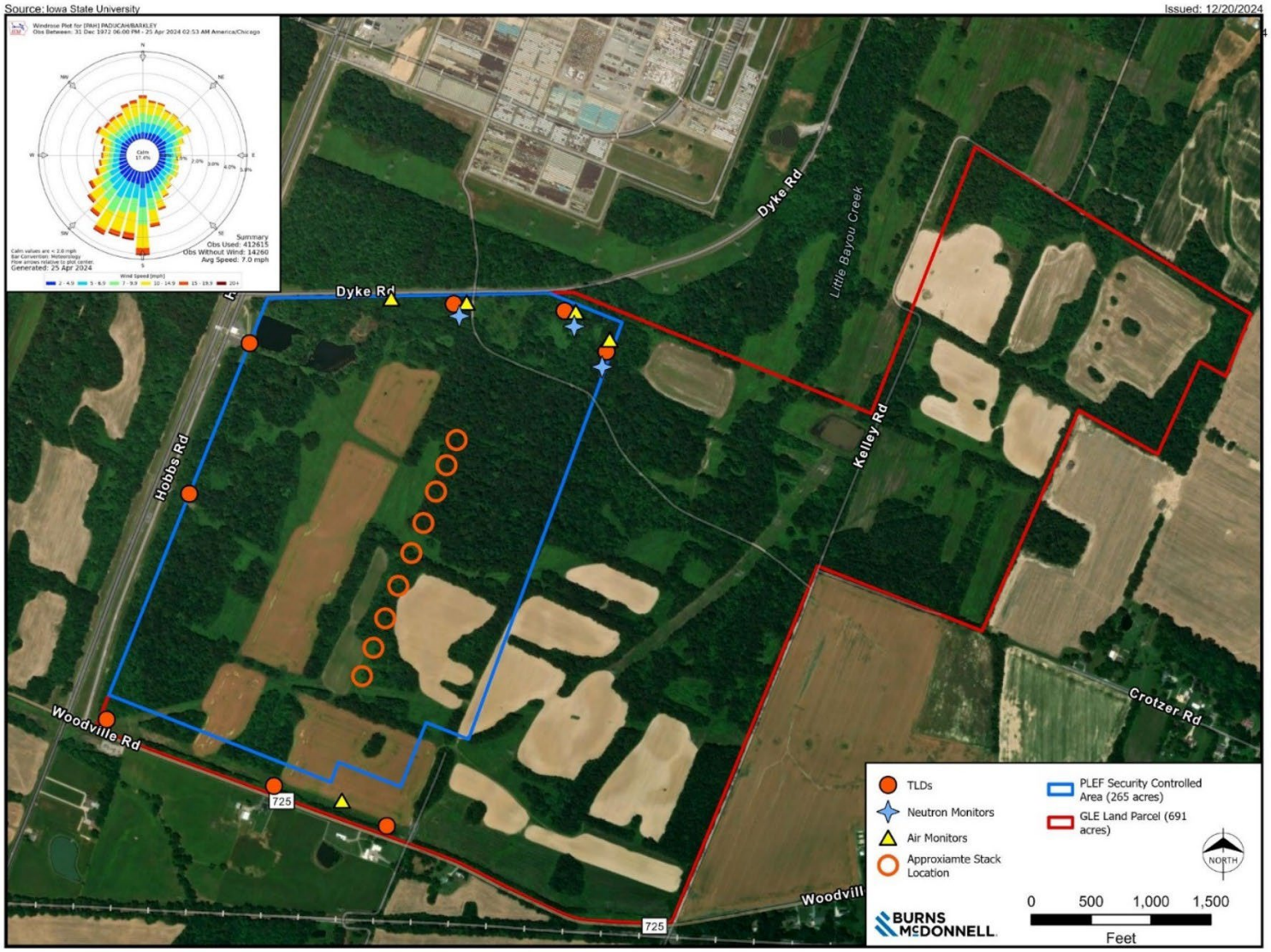


Figure 6-1: Proposed Nearby Air and Direct Dose Monitoring Locations



Figure 6-2: Ground Water Monitoring Locations

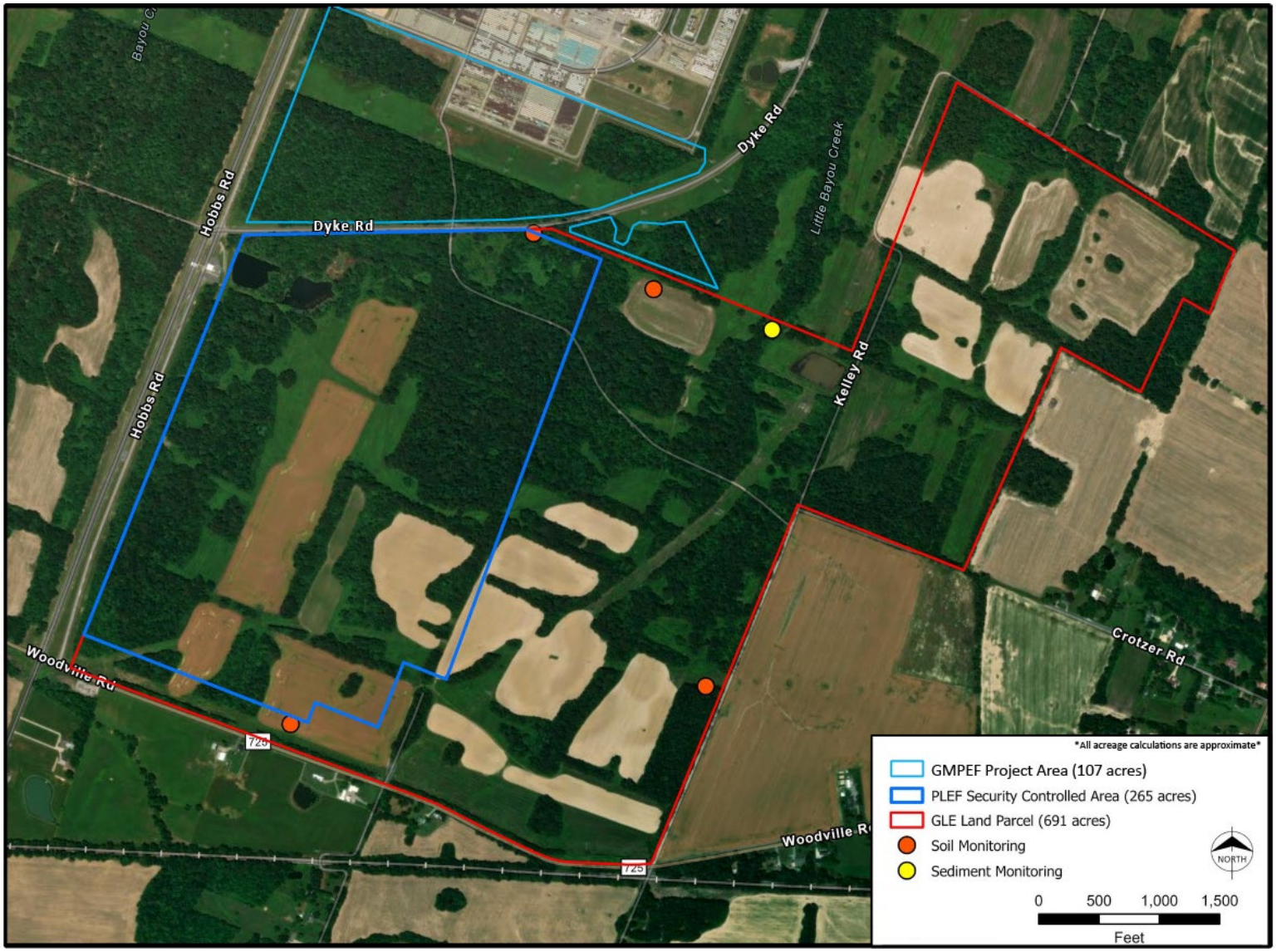


Figure 6-3: Soil Monitoring Locations

6.1.6 Sediment Monitoring

All effluent outfall sediments will be monitored to ensure compliance with discharge limits.

6.1.7 Uranium Hexafluoride Cylinder Storage Pad Stormwater Monitoring

Stormwater from the UF_6 cylinder storage pads would be sampled and analyzed in accordance with KPDES permit requirements. If any contamination above permit limits was detected, outfall control structures would be used to restrict discharge, and water would be treated before discharge.

6.1.8 Kentucky Surveillance Program Description

The Kentucky Department for Environmental Protection, Division of Waste Management conducts an area surveillance program (GLE, 2025; Commonwealth of Kentucky, 2023). This program consists of the following sampling activities within the Paducah Gaseous Diffusion Plant Site:

- Air samplers
- Groundwater
- Sediment
- Soil
- Surface water

Samples are grab samples, except for the air samples. Ambient air stations operate continuously, with samples pulled at 21-day periods. The balance of the program is conducted at various frequencies (i.e., quarterly or semi-annually). Among other analytes, samples are analyzed for gross alpha and gross beta concentrations. If trigger levels for gross alpha and/or gross beta are exceeded, then the sample is further analyzed for isotopic radionuclides.

6.1.9 Direct Radiation Monitoring During Construction

It is expected that the first enrichment module commissioned would begin operating while work is ongoing to complete subsequent enrichment modules. Thus, it is likely that there would be radioactive material handled on site while construction workers are present. Construction workers would be trained and subject to appropriate radiation dose monitoring as needed. Should the initial monitoring period demonstrate that the expected dose rate is comparable with normal background levels (i.e., away from the DOE Paducah Site) the construction worker radiation monitoring program would be re-evaluated.

6.2 Physiochemical Monitoring

During preparation of the GMPEF Project Area and construction of the GMPEF, worker and public exposure to dust would be monitored in accordance with the Industrial Hygiene Safety Program. The use of hazardous chemicals during construction would be minimized as much as possible, and PPE would be used when appropriate. In addition, a KPDES General Permit for Construction Stormwater would be in place prior to commencement of any construction activities. The issuance of a KPDES General Permit for Construction Stormwater is tied to submission of an Erosion and Sedimentation Control Plan to the Kentucky Department for Environmental Protection Division of Water, Surface Water Permits Branch. This plan would include monitoring requirements that would be implemented throughout construction.

During operations, several types of physiochemical (nonradiological) monitoring would be performed to protect the safety of the workers, public, and environment. Stack monitoring for fluoride would be conducted in accordance with the Kentucky Department for Environmental Protection Division for Air Quality (KDAQ) air quality permit requirements.

Groundwater quality and levels would be monitored to detect abnormal or adverse conditions (e.g., unanticipated lowering of groundwater levels). Lastly, industrial health and safety monitoring would ensure that noise levels, indoor air quality, and ergonomics are controlled to maintain the health and safety of the workers.

6.2.1 Air Monitoring

In accordance with the KDAQ air quality permit, the air emission control system stacks for the main GMPEF uranium enrichment buildings would be sampled continuously to monitor for any fluoride emissions to the atmosphere. The collection filter in the stack-sampling system would be a filter paper impregnated with calcium carbonate or equivalent. The filter would be removed weekly and analyzed for fluoride content. The quantity of fluoride released from the stack would then be calculated using the analytical results and the weekly exhaust volume of the stack and the associated stack sampler volume (in ratio). Analysis of samples would be conducted in conformance with KDAQ requirements.

6.2.2 Groundwater Monitoring

The quarterly groundwater monitoring program described in Section 6.1.4, *Groundwater Monitoring*, would include sampling and analysis for fluoride concentrations and would perform measurements of groundwater pH, temperature, and specific conductance in the field during sampling. In addition to groundwater sample collection and laboratory analysis, groundwater elevations would be measured from the monitoring well network during each sampling event.

6.3 Industrial Health and Safety Monitoring

The objectives of these programs are to maintain or improve workplace safety and to create and maintain employee interest in safety operations. To accomplish these objectives, the Industrial Hygiene and Safety (IHS) Function would take actions to achieve the following:

- Identify and prioritize operational safety concerns.
- Establish and recommend a course of action for high-priority concerns or issues.
- Maintain a continual awareness of the status of each project and follow up to completion.
- Present project identification reviews and closures to area managers.
- Inspect shop area for compliance with standards.
- Plan future activities to generate interest in safety.
- Review accidents.
- Review safety recommendations from employees.
- Plan and conduct safety meetings/reviews.
- Promote safety awareness among associates.

To comply with Occupational Safety and Health Administration standards (29 CFR Part 1910), the IHS Function would prepare and maintain the *Safety, Health, and Fire Protection Manual*. This manual would contain information about industrial health and safety policies and procedures and be available both in hard copy and on-line. This manual would be broken down into sections. The first two sections would contain general information that includes both administrative information and General Safety Rules that would apply to everyone at the GMPEF Site. The third section would be the core of the manual and contain procedures related to specific tasks or equipment. The next sections would contain rules on health and PPE that are designed for a range of situations. There would be a section that describes fire protection procedures and provides information and rules that help prevent fires and minimize the danger and

damage if a fire does occur. There would also be a section that provides material-handling information, which would cover moving and storing parts, equipment, and product. Finally, there would be a section that provides information on contractor responsibilities, establishing procedures for training, GMPEF Site access, and contractor safety qualifications.

The following sections describe measurements, monitoring activities, and other procedures that would be implemented for compliance with the *Safety, Health, and Fire Protection Manual*.

6.3.1 Indoor Air Quality

The IHS Function would be responsible for monitoring the level of indoor air contaminants within a building so that they do not exceed established exposure limits. IHS would evaluate job functions for potential employee exposures, provide industrial hygiene monitoring, and assist in maintaining air contaminant concentrations below the established exposure limits through the use of ventilation controls, work practices, and PPE.

6.3.2 Noise Monitoring

Prior to operation of new processes, the IHS Function would perform a review of high-noise equipment, processes, and areas to identify potential employee exposures in excess of the action level for noise. Periodic noise measurements would be taken around the GMPEF to verify that employee noise exposure is limited. Employee noise exposure monitoring that is representative of a specific job classification would be conducted whenever there is an addition of new equipment; a change to the process operation, equipment, or controls; or when any information indicates that an employee's noise exposure may exceed the action level for noise.

The action level for noise monitoring is the level of noise at which:

- An employee must be enrolled in the Hearing Conservation Program and provided audiometric testing.
- Representative noise exposure monitoring is required.
- Hearing protectors and training on noise hazards must be provided to employees.

The Occupational Safety and Health Administration has set the current action level at 85 A-weighted decibels over an 8-hour period. The IHS Function would verify that representative employee exposure monitoring is conducted; Hearing Conservation Areas (i.e., greater than or equal to 85 A-weighted decibels operating noise level – hearing protection required) are posted or properly labeled, training programs are developed, and hearing protection has adequate noise-reduction capabilities. The ambient noise monitoring program would continue throughout construction, operation, and decommissioning of the Proposed Action and would be adjusted or expanded as appropriate.

7.0 COST-BENEFIT ANALYSIS

The purpose of this section is to identify potential benefits and costs of the Proposed Action and its range of alternatives to better inform the decision-making process. This section compares the potential impacts identified in this Environmental Report (ER) in Table 7-1.

7.1 Introduction

Examining the benefits and costs of the Proposed Action includes a cost-benefit analysis, which attempts to measure the overall impact of a Proposed Action on society's well-being, including private benefits and costs to the General Matter Paducah Enrichment Facility's (GMPEF's) owners along with external benefits and costs experienced by other members of society. Benefits and costs of the Proposed Action result from changes in conditions relative to baseline conditions. Baseline conditions are defined as conditions expected to exist throughout the lifetime of the GMPEF in the absence of the impacts. Where possible, impacts of the Proposed Action have been measured relative to projected baseline conditions. In general, when projections of future conditions are not available, impacts are measured relative to current conditions.

7.2 No Action Alternative

Under the No Action Alternative, the United States (U.S.) Nuclear Regulatory Commission (NRC) would not issue a license to construct and operate the proposed GMPEF, and the facility would not be built. The No Action Alternative would result in no additional environmental impacts to the area around the Paducah Site. Current levels and/or projections of land development, groundwater and surface water availability and quality, and air emissions and quality, would remain the same. Additionally, the benefits of the GMPEF would not be realized. If the demand for fuel for nuclear power plants grows, there may be increasing shortages of enriched uranium that would be produced by the GMPEF. Therefore, the No Action Alternative has the potential to result in increased fuel costs and the reliance on foreign suppliers, which could lead to unreliable supply chains and potential impacts to the U.S. energy production needs and security.

7.3 Proposed Action

The Proposed Action is issuance of a license to construct and operate a uranium enrichment facility on land adjacent to the existing U.S. Department of Energy (DOE) Paducah Site near Paducah, Kentucky. A complete description of the Proposed Action is presented in Section 2.1.2, *Proposed Action.*

The Proposed Action has the potential to create both benefits and costs. Benefits could include, but are not limited to, improved U.S. energy security, greater enriched uranium production, reduced energy production combustion emissions, greater energy efficiency, and additions to economic and fiscal environments. Costs could include, but are not limited to, the cost of constructing and operating the GMPEF and a range of potential environmental impacts, including impacts on land use, transportation, geology, groundwater, surface water, floodplains, wetlands, water use, ecological resources, air quality, public and educational services, housing, public and occupational health, and waste management. Table 7-1 summarizes the benefits and costs estimated to result from the Proposed Action.

Additional socioeconomic and environmental benefits could include, but not be limited to, profits earned from GMPEF operations and additional jobs and spending in the regional economy. Similarly, additional tax revenues that would be received by Federal, State, and local governments resulting from the Proposed Action can also be regarded as a socioeconomic benefit. Environmental benefits of the Proposed Action

include increased energy security due to the increased quantity and reliability of enriched uranium supply, possible increases in the share of electric power that is generated by nuclear plants, and [redacted] (Trade Secret / Confidential Commercial Information). The GMPEF would provide enriched uranium to fuel existing and potential new U.S. nuclear power plants, and nuclear power plants provide a critical source of base-load electricity without emitting air pollutants associated with combustion-related power generation. The estimated environmental and socioeconomic costs of the GMPEF are generally small.

Table 7-1, *Summary of Projected Benefits and Costs*, summarizes the information presented previously in this document.

Based on the information presented in Table 7-1, the Proposed Action is expected to result in net positive benefits.

Table 7-1: Summary of Projected Benefits and Costs

Cost-Benefit Category	Description	Scale of Impacts
Benefits		
Energy Security	Increases availability of nuclear fuel, reducing reliance on foreign sources of enriched uranium; establishes an advanced uranium-enrichment technology in the United States.	LARGE
Enriched Uranium Produced	Increases availability of enriched uranium by several million SWUs; helps address projected SWU shortfall in United States.	LARGE
Reduced Emissions	By allowing increased nuclear power generation, may encourage reduced emissions of criteria pollutants and greenhouse gases by fossil-fuel fired electric utility power plants.	MODERATE
[redacted]	[redacted] (Trade Secret / Confidential Commercial Information)	[redacted]
Economic Impacts	Would employ hundreds of workers during construction and startup and approximately 140 workers during operation; increases regional income due to employee payroll and local purchases by GeM of goods and services.	SMALL
Tax Receipts	Increases sales and income taxes due to GMPEF and employee spending; increases corporate income tax due to tax on GMPEF profits.	SMALL
Costs		
Construction Cost	Proprietary information.	MODERATE
Operating Cost	Proprietary information.	MODERATE
Land Use	SMALL Tree-clearing activities and grading activities have taken place on approximately 70 acres of the approximately 107-acre site as discussed in the CX determination in Site Preparation Including Tree Clearing (Parcel A) at the PGDP, Paducah, Kentucky (CX-270853) and GeM site preparation (Parcel A) at the PGDP, Kevil, McCracken, Kentucky (451.1a-093), respectively. The Proposed Action would require tree clearing and grading of 6.8 acres of	SMALL

Table 7-1: Summary of Projected Benefits and Costs

Cost-Benefit Category	Description	Scale of Impacts
	presently undeveloped forested land, which will be evaluated in a separate NEPA analysis by the appropriate regulatory authority. The remaining 30 acres of the GMPEF Site were cleared and graded prior to GeM's lease and are now periodically mowed vegetation areas under the transmission line right-of-way. Therefore, the land use impacts resulting from construction of the GMPEF (i.e., change in land cover) would be SMALL.	
Transportation	SMALL to MODERATE The radiological exposure (doses) to the public and workers for radioactive shipments would result in SMALL impacts. Increased traffic during construction and operation of the GMPEF could have some adverse impact on the traffic flow and increase the potential for traffic congestion at the Hobbs Road and U.S. Highway 60 intersection during peak commuting hours. Therefore, traffic impacts for construction and operation of the GMPEF on a local basis are anticipated to be MODERATE.	SMALL regionally, MODERATE locally
Geology and Soils	SMALL to MODERATE Bedrock geology is located at a significant depth below the GMPEF Site (>600 feet), and it is not anticipated that construction activities will impact the geology. Rough grading activities have occurred for approximately 100 acres of the GMPEF Site. Approximately 6.8 acres of presently undeveloped forested land would still need to be cleared and graded, which will be evaluated in a separate NEPA analysis by the appropriate regulatory authority. Because soils would be stripped from the site, impacts on soils resulting from construction activities are expected to be MODERATE.	SMALL to MODERATE
Water Resources	SMALL to MODERATE Neither groundwater nor surface water would be withdrawn on site and there would be no discharge of untreated process or sanitary wastewater. Therefore, impacts to these resources would be SMALL. Current drainage from the GMPEF Site flows east to Little Bayou Creek and its unnamed tributaries and west to Bayou Creek. Due to vegetation removal, grading, and other land-disturbing activities, increased sediment loadings to receiving streams could occur during construction. As such, a KPDES stormwater construction general permit would be required, and a Storm Water Pollution Prevention Plan would be produced. Impacts on surface water quality are anticipated to be SMALL.	SMALL
Ecological Resources	SMALL to MODERATE Construction of the GMPEF would directly impact ecological resources via temporary and permanent disturbance, degradation, or loss of habitat from land-clearing activities or disturbance or displacement of wildlife due to an increase in noise and human activity. Impacts could also include	SMALL to MODERATE

Table 7-1: Summary of Projected Benefits and Costs

Cost-Benefit Category	Description	Scale of Impacts
	fragmentation of remaining habitats resulting from project developments and increases in human-wildlife interactions (such as encounters and collisions between wildlife and motor vehicles). The conversion of ecological resources due to construction of the GMPEF would noticeably alter the composition of habitat within the GMPEF Site but would not destabilize the existence of these communities off site; therefore, direct and indirect impacts to existing vegetation and wildlife on site would be MODERATE. Construction of the GMPEF would noticeably alter the composition of wetland habitat within the GMPEF Site but would not destabilize the existence of wetland communities off site; therefore, impacts to wetlands would be MODERATE.	
Meteorology, Climatology, and Air Quality	SMALL Air pollutant emissions from equipment used for construction and fugitive emissions from earth disturbing activities would have a temporary impact on the existing ambient air quality in the vicinity of the GMPEF Site. Construction emissions impacts decrease rapidly with distance from a construction site and would not result in long-term impacts. Air emissions from trucks and worker vehicles traveling to and from the GMPEF Site would produce more dispersed and intermittent air quality impacts along local and regional roadways that link to the project site. Emissions from the GMPEF would not measurably change the existing ambient air quality in the vicinity of the GMPEF. Air emissions from mobile combustion equipment and vehicles during decommissioning are expected to be similar to those estimated for construction. Therefore, air quality impacts resulting from the Proposed Action are anticipated to be SMALL.	SMALL
Noise	SMALL The closest offsite sensitive sound receptor to GMPEF would be residences located approximately 4,300 feet south of the GMPEF Site along Woodville Road. Noise generated on site during construction would be consistent with existing measured ambient sound levels at offsite locations. Noise generated from operations would be below the NRC noise level threshold sound level and vibrations would be imperceptible at the closest sensitive location. Decommissioning of the GMPEF would produce sound levels similar to or lower than construction activities. Therefore, noise impacts resulting from the Proposed Action are anticipated to be SMALL.	SMALL
Historical and Cultural Resources	SMALL Operation of the facility would not damage historic properties, because no cultural resources have been recommended eligible for the NRHP. As they would not be physically affected by the GMPEF, no adverse effect to historic properties is anticipated from operation of the facility. Also, no indirect effects would be anticipated from project implementation. Therefore, historical and	SMALL

Table 7-1: Summary of Projected Benefits and Costs

Cost-Benefit Category	Description	Scale of Impacts
	cultural resources impacts resulting from the Proposed Action are anticipated to be SMALL.	
Visual/Scenic Resources	SMALL to MODERATE Temporary visual intrusions into the landscape would result from the use of 300-foot tall construction cranes at the GMPEF Site for erecting building structures and installing equipment during the 2-year construction period. Therefore, the visual/scenic resource impacts resulting from construction of the GMPEF would be MODERATE but temporary to offsite receptors. The GMPEF would be compatible with the BLM VRMS Management Class IV designation. The visual/scenic resource impacts of GMPEF operations at viewpoints outside of the GMPEF Site would be mitigated by the design of 72-foot tall buildings and other GMPEF structures, their distance from public viewpoints, and screening by vegetation. Therefore, visual/scenic resource impacts resulting from operation of the Proposed Action are anticipated to be SMALL.	SMALL to MODERATE
Socioeconomic Environment	SMALL Construction of the GMPEF would generate a limited number of new, short-term construction jobs. The projected influx of workers and families is not predicted to strain the housing stock, local school system, or health care system. Operation of the GMPEF would generate a limited number of new jobs. The relatively small number of workers and their families that would be present during GMPEF operations would not strain the housing stock, education, health care, or law enforcement systems. Decommissioning would result in similar overall social and economic impact as construction. Therefore, socioeconomic impacts resulting from the Proposed Action are anticipated to be SMALL.	SMALL
Public and Occupational Health	SMALL Nonradiological impacts to public and occupational health are anticipated to be SMALL since GMPEF operations would be managed through adherence to the air permit received from KDAQ (which is protective of human health and account for all area sources). The impacts associated with potential radiological exposures from the Proposed Action are anticipated to be SMALL for both workers and the public. Through the combination of plant design, passive and active engineered controls (Items Relied on for Safety), and administrative controls, accidents would pose an acceptably low risk to workers, the environment, and the public. Therefore, overall public and occupational health impacts resulting from the Proposed Action are anticipated to be SMALL.	SMALL
Waste Management	SMALL to MODERATE Most solid waste and wastewater management impacts from construction, operation, and D&D of the Proposed Action would be SMALL. For this project, GeM will obtain Kentucky Pollutant	SMALL to MODERATE

Table 7-1: Summary of Projected Benefits and Costs

Cost-Benefit Category	Description	Scale of Impacts
	Discharge Elimination System permit coverage for two additional outfalls to Bayou Creek and Little Bayou Creek. Stormwater runoff would then be conveyed to the new outfalls. No process or cooling water will be discharged to the DOE C-615 treatment plant system. Cooling water will be treated and then discharged to Bayou or Little Bayou. Stormwater from the GMPEF Site would not impact the DOE stormwater management system. The projected maximum amount of new DUF_6 generated by the GMPEF over a 40-year operating period is 498,000 metric tons (approximately 40,100 cylinders). This could have a MODERATE impact on DUF_6 conversion facilities and LLRW disposal facilities.	

Key: > = greater than; BLM = Bureau of Land Management; CX = Categorical Exclusion; D&D = decontamination and decommissioning; DOE = United States Department of Energy; DUF_6 = depleted uranium hexafluoride; GeM = General Matter, Inc.; GMPEF = General Matter Paducah Enrichment Facility; KDAQ = Kentucky Department for Environmental Protection Division for Air Quality; KPDES = Kentucky Pollutant Discharge Elimination System; LLRW = low-level radioactive waste; NRC = United States Nuclear Regulatory Commission; NRHP = National Register of Historic Places; PGDP = Paducah Gaseous Diffusion Plant; SWU = Separative Work Unit; U.S. = United States; VRMS = Visual Resources Management System

8.0 GLOSSARY

100-year floodplain – Any land area that is subject to a 1 percent or greater chance of flooding in any given year from any source.

AADT (Average Annual Daily Traffic) – The total volume of vehicle traffic in both directions of a highway or road for a year divided by 365 days.

ALARA (As Low As Reasonably Achievable) – Making every reasonable effort to maintain exposures to radiation as far below the dose limits as is practical and consistent with the purpose for which the activity is undertaken, taking into account the state of technology, the economics of improvements in relation to the state of technology, the economics of improvements in relation to the benefits to public health and safety, and other societal and socioeconomic considerations, as well as in relation to utilization of radiation and radioactive materials in the public interest.

Alluvium – Clay, silt, sand, gravel, or similar unconsolidated detrital material, deposited during comparatively recent geologic time by a stream or other body of running water.

Ambient Sound Level – A sound level that represents the background noise from community or environmental sound sources.

Aquifer – A subsurface rock or sediment formation that is porous and permeable. To be an aquifer, it must have these traits to a high enough degree that it stores and transmits useful quantities of water.

Atterberg limit – A set of parameters for fine-grained silt/clay soils that determine the relative activity of the soils and their relationship to moisture content. The liquid limit, plastic limit, and shrinkage limits define the relative points at which soils transition between the liquid and plastic, plastic and semisolid, and semisolid and solid states, respectively. The parameters are measured in a laboratory test performed according to ASTM D4318 (ASTM, 2005).

A-weighting – A series of filters applied to an unfiltered (or flat) sound level. The A-weighting is used to generate a single number sound level that is intended to be representative of human response to sound.

Background radiation – Radiation from cosmic sources; naturally occurring radioactive material, including radon (except as a decay product of source or special nuclear material); and global fallout as it exists in the environment from the testing of nuclear explosive devices or from past nuclear accidents that contribute to background radiation and are not under the control of the licensee. "Background radiation" does not include radiation from source, byproduct, or special nuclear materials regulated by the United States (U.S.) Nuclear Regulatory Commission (NRC).

Basement rock – The crust of Earth, usually igneous or metamorphic, below sedimentary deposits.

Beta radiation – A light, short-range particle (an ejected electron) emitted during the radioactive decay of many beta-active, unstable nuclides. Examples of pure beta-emitters are the radionuclides strontium-90 and tritium. Beta radiation is moderately penetrating and can penetrate human skin to the germinal layer (where new skin cells are produced). Beta-emitting contaminants may be harmful if ingested or inhaled.

Biotic community – A group of organisms living and interacting within the same habitat.

Bryophytic vegetation – A non-vascular, terrestrial, moss-like plant.

Bryozoan – Any sessile marine or freshwater animal of the phylum Bryozoa, forming branching, encrusting, or gelatinous moss-like colonies of many small polyps.

Calcar – A projection of cartilage of the ankle of a bat covered with a membrane that forms a pouch to catch and hold insects.

Calcareous – Term used to describe a substance that contains calcium carbonate. When applied to a rock name, it implies that as much as 50 percent of the rock is calcium carbonate.

Cambrian – The first period of the Paleozoic era, lasting from 538.8 million to 485.4 million years ago.

Canopy – The uppermost vegetative layer, generally formed by stands of trees.

Carcinogen – A chemical or radiation that is capable of inducing cancer.

Cenozoic – An era of geologic time, from the beginning of the Tertiary period to the present; considered to have begun about 65 million years ago.

Census block – The smallest geographic unit used by the U.S. Census Bureau for tabulation of 100 percent data (data collected from all houses, rather than a sample of houses). Several Census blocks make up Census Block Groups, which can be combined to create census tracts.

Chert – A hard, fine-grained sedimentary rock composed of microcrystalline or cryptocrystalline quartz.

Clean Water Act (CWA) – Federal act that regulates discharges of pollutants into the Waters of the United States (33 United States Code [U.S.C.] 1251 et seq.).

Committed dose equivalent (CDE) – The dose equivalent to organs or tissues of reference that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.

Committed effective dose equivalent (CEDE) – The sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to these organs or tissues.

Concentration – The amount of matter contained within a unit volume. Concentration is often expressed in micrograms per cubic meter of air by the AERMOD dispersion model.

Confining unit – A body of impermeable or distinctly less-permeable material that is stratigraphically adjacent to one or more aquifers.

Consumptive use – Water use where the water is withdrawn from the source and not returned.

Contact (geologic) – A plane or irregular surface between two types or ages of rock.

Convection – The process of transferring heat upward in the atmosphere by the rising of warm air. The results of convection are sometimes showers and thunderstorms.

Cosmogenic – Produced by the action of rays that come from outer space.

Craton – A stable part of a continent that experiences minimal deformation over a long period, serving as a stable interior during surrounding orogenic events.

Cretaceous – A period of the Mesozoic era, from 140 million to 65 million years ago.

Criteria Air Pollutant – The 1990 amendments to the Clean Air Act required the U.S. Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for certain pollutants known to be hazardous to human health. The EPA has identified and set standards to protect human health and welfare for the following six pollutants: sulfur dioxide, particulate matter, nitrogen dioxides, carbon monoxide, ozone, and lead. The term “criteria pollutants” derives from the requirement that the

EPA must describe the characteristics and potential health and welfare effects of these pollutants. NAAQS are set or revised on the basis of these criteria.

Criterion – A parameter that is a measurable characteristic and is used to compare sites using site-specific data.

Cross section – A graph or drawing that shows features transected by a given plane.

Cultural resource – Locations or objects that retain evidence of historic or cultural activities that are 50 years of age or older.

Curie – The basic unit used to describe the intensity of radioactivity in material. One curie equals the quantity of radioactive material in which there are 37 billion ($3.7x10^{10}$) nuclear transformations (i.e., disintegrations) per second, which is approximately the activity of 1 gram of radium.

Day-night average sound level (L_{dn}) – A sound level that represents the average sound level during daytime hours and nighttime hours, with the nighttime hours having a 10 decibel increase to represent the higher sensitivity of humans at those hours.

Daytime hours – Hours between 7:00 a.m. and 10:00 p.m.

Decay product – A new nuclide formed as a result of radioactive decay. A nuclide resulting from the radioactive transformation of a radionuclide, formed either directly or as the result of successive transformations in a radioactive series. A decay product (daughter product or progeny) may be either radioactive or stable.

Decibels – A logarithmic ratio of a sound pressure level over a reference pressure level of 20 micropascal (μPa).

Deciduous – Trees, shrubs, or vines that shed their leaves, typically in autumn, and lie dormant during the winter months.

Deltaic – Sedimentary deposits laid down in a delta and characterized by a mixture of sand, clay, brackish-water organisms, and organic matter.

Design-basis earthquake event – The earthquake specified by the International Building Code for use in structural design. The safety systems at a site must be designed to remain functional both during and after the event, thus assuring the ability to shut down and maintain a safe configuration.

Dewater – In the context of waste management, the process of natural, chemical, or mechanical removal of water from a sludge, thereby reducing it to a damp solid with the lowest level of moisture attainable.

Dewpoint – Temperature to which air must be cooled at constant pressure for condensation to occur. This is the temperature at which the air would become saturated, and dew would form.

Dike Swarm – A large geological structure consisting of a major group of parallel, linear, or radially oriented magmatic dikes in rift zones.

Dip – The angle that a structural surface, such as a bedding or fault plane, makes with the horizontal, measured perpendicular to the strike of the structure and in the vertical plane.

DNA (Deoxyribonucleic acid) – The human material that carries the genetic information in the cell and that is capable of self-replication and synthesis of ribonucleic acid (RNA). DNA consists of two long chains of nucleotides twisted into a double helix and joined by hydrogen bonds between the complementary bases adenine and thymine or cytosine and guanine. The sequence of nucleotides determines individual hereditary characteristics.

Dose equivalent – The product of the absorbed dose in tissue, the quality factor, and all other necessary modifying factors at the location of interest (units are rem or sievert [Sv]).

Downdraft – Downward-moving air inside a thunderstorm caused by the density of cooler air.

Drainage area – Land area where precipitation runs off into creeks, streams, rivers, lakes, and reservoirs at a specific point.

Dry Conversion Process (DCP) – A chemical reaction between vaporized uranium hexafluoride and superheated steam, followed by a pyrohydrolysis and reduction in a hydrogen atmosphere, to produce uranium dioxide.

Ecoregion – A classification of land based on similar climate, vegetation, and topography.

Effluent – A liquid discharged as waste, such as contaminated water from a facility.

Embayment – A coastal recess that forms a bay.

Emissions – Gases, particles, or liquids released into the atmosphere from smokestacks, other vents, and surface areas of commercial or industrial facilities.

Endangered – Any species or subspecies designated as endangered by the Secretary of the Interior on a current United States List of Endangered and Threatened Wildlife as recorded in 50 *Code of Federal Regulations* (CFR), Part 17, is considered an endangered species in Kentucky under the provisions of Kentucky Revised Statutes 150.183. Those species described as "threatened" on the above Federal list are not included under Kentucky Revised Statutes 150.183 or this administrative regulation (301 KAR 3:061).

Endangered Species Act – The Endangered Species Act of 1973, Public Law 93-205 (87 Stat. 884), as it may be subsequently amended.

Energy Equivalent Sound Level (L_{eq}) – A sound level that represents the average energy level of the measurement period.

Environmental Impacts – Standard of significance established by the NRC in NUREG-1748, p. 4-14:

> SMALL: The environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
>
> MODERATE: The environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
>
> LARGE: The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

Environmental sound monitor – A measurement device that includes a microphone and data recorder to log the numerical values of environmental sound levels over time. The data-logging component of the monitor is packaged into a weatherproof box to protect it from the elements, whereas the microphone is routed via a cable to a tripod.

Eocene – An epoch of the Tertiary period, occurring from 55 to 40 million years ago and characterized by the advent of the modern mammalian orders.

Ephemeral – A stream that flows only in direct response to precipitation in the immediate watershed or in response to the melting of a cover of snow and ice and that has a channel bottom that is always above the local water table. (401 KAR 48:005).

Epicenter – The point on Earth's surface directly above the source of an earthquake.

Erosion potential – The likelihood of movement of soil due to runoff.

Evergreen – Trees, shrubs, or vines that retain their leaves throughout the winter.

Facies – A mappable, areally restricted part of a lithostratigraphic body, differing in lithology or fossil content from other beds deposited at the same time and in lithologic continuity.

Faults – A fracture or fracture zone in rock along which movement has occurred.

Federal Species of Concern – Species about which there are some concerns regarding its status and threats, but for which insufficient information is available to indicate a need to list the species under the Endangered Species Act (69 Federal Register 19975; April 15, 2004).

Flood Insurance Rate Maps (FIRMs) – Flood hazard maps that show the areas in a community that are subject to flooding and the risk associated with these flood hazards; published by the Federal Emergency Management Agency (FEMA) under the administration of the National Flood Insurance Program. One of the areas shown on the FIRM is a Special Flood Hazard Area (SFHA). The SFHA is the area that has a 1 percent or greater chance of flooding in any given year; this area is also referred to by some as the 1 percent annual chance floodplain, base floodplain, or the 100-year floodplain. The flood hazard and risk information presented on the FIRMs is the result of engineering studies that are performed by engineering companies, other Federal agencies, or communities, which are reviewed for compliance with FEMA guidelines and approved by FEMA.

Flood Insurance Study (FIS) – A book that contains information regarding flooding in a community and is developed in conjunction with the FIRMs. The FIS, also known as a flood elevation study, frequently contains a narrative of the flood history of a community and discusses the engineering methods used to develop FIRMs. The FIS also contains flood profiles for studied flooding sources and can be used to determine base flood elevations (BFEs) for some areas.

Flooding – The inundation of land areas by water.

Floodplain – The relatively flat area surrounding a river that is prone to occasional or periodic flooding.

Fluvial – (A) Of or pertaining to a river or rivers. (B) Existing, growing, or living in or about a stream or river. (C) Produced by the action of a stream or river (e.g., sand and gravel deposits).

Formation (geologic) – A persistent body of igneous, sedimentary, or metamorphic rock, having easily recognizable boundaries that can be traced in the field without recourse to detailed paleontologic or petrologic analysis and that is large enough to be represented on a geologic map as a practical or convenient unit for mapping and description; the basic cartographic unit in geologic mapping.

Fragipan – A soil horizon composed of an altered subsurface soil layer that restricts water flow and root penetration.

Frequency – The rate at which a sound pressure fluctuates, stated in Hertz (Hz).

Front – The boundary between differing air masses.

Fuel Fabrication Facility – A facility that uses enriched uranium to manufacture fuel for nuclear power reactors.

Fugitive dust – Particulates that are suspended in the atmosphere due to activities on the ground, such as grading, digging, wind erosion, plowing, or driving on unpaved surfaces.

Fujita Scale – A scale created by Tetsuya Fujita used to describe the intensity of tornadoes, which is based on damage to man-made structures and vegetation.

Gamma radiation – High-energy, short-wavelength, electromagnetic radiation emitted from the nucleus. Gamma radiation frequently accompanies alpha and beta emissions and always accompanies fission. Gamma rays are very penetrating and are best stopped or shielded by dense materials, such as lead or depleted uranium. Gamma rays are similar to X-rays.

General Electric Company (GE) – Owner of the Global Nuclear Fuel–Americas fuel fabrication facility in Wilmington, North Carolina.

Global Laser Enrichment, LLC (GLE) – the applicant for a license to construct and operate the Paducah Laser Enrichment Facility (PLEF) near Paducah Kentucky.

GeM Land Parcel – Approximately 107 acres of land on the U.S. Department of Energy (DOE) Paducah Site where the proposed action will be located. Also referred to as the General Matter Paducah Enrichment Facility (GMPEF) Site.

GLE laser-based technology – GE-Hitachi Nuclear Energy (GEH) modified the SILEX technology for the test loop and for the GLE commercial facility.

Global Nuclear Fuels–America (GNF-A) – Owner/operator of the fuel fabrication facility in Wilmington, North Carolina.

GMPEF Project Area – The area to be used for the construction and operation of the proposed activity, consisting of approximately 107 acres. Also known as the GMPEF Site.

GMPEF Site – The area to be used for the construction and operation of the proposed activity, consisting of approximately 107 acres. Also known as the GMPEF Project Area.

Graben – A valley with a distinct escarpment on each side caused by the displacement of a block of land downward.

Grading – A progressive change in particle size from top to bottom in a rock layer. Most common is a sequence with coarse grains at the bottom and fining upward, which is typically caused by a declining current velocity within the depositional environment.

Hazardous Air Pollutant (HAP) – Air pollutants listed in Section 112(b)(1) of the Clean Air Act that are not subject to NAAQS, but that may present a threat of adverse human health effects or adverse environmental effects.

Hazardous Waste – A solid waste, or a combination of solid wastes, that is defined under the Resource Conservation and Recovery Act (RCRA) (42 U.S.C. Section 6903, *Definitions*) to be hazardous because of its quantity, concentration, or physical, chemical, or infectious characteristics that may (i) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (ii) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed (40 CFR 261.3).

Herbaceous – Non-woody vegetation.

Horizon – Distinctive layer that makes up a soil profile and aids in the understanding of how the soil was formed. Most soils have three or more horizons.

Holocene – An epoch of the Quaternary period, from the end of the Pleistocene, approximately 10,000 years ago, to the present time; also known as the Recent period.

Hydraulic conductivity – A measure of the permeability of a porous medium or the relative ability of groundwater to flow through the system.

Hydrogeologic – Dealing with subsurface waters and with related geologic aspects of surface waters.

Hydrology – The study of how water occurs in the atmosphere, on the ground, and below the ground surface.

Incorporated area – An area that is located within the jurisdiction of a local government.

Indirect impacts – Those impacts that would not directly destroy the physical integrity of a significant cultural resource but would either adversely affect an element or elements that contribute to the significance of the resource or would increase the risk of destruction by outside action.

Intermittent stream– A stream that flows only at certain times of the year (401 KAR 10:001 Section 1, (39)).

Intracratonic Basin – Areas on the craton, at some distance from the craton margin, undergoing differential subsidence relative to the surrounding area of cratonic basement.

Invertebrate – Any animal lacking a vertebral column.

Ionizing radiation – Any radiation capable of displacing electrons out of atoms and producing ions. Some examples are alpha, beta, gamma, X-rays, neutrons, and ultraviolet light.

Isotope – A form of an element that differs from the normal form of the element by atomic mass due to a differing number of neutrons in the nucleus of the atom.

Jet stream – A fast-moving band of strong winds in the mid latitudes that occurs in the upper portion of the troposphere (lower layer of the atmosphere). The jet stream's position provides an indication as to the separation of air masses, such as polar and tropical.

Karst – A type of topography that is formed on limestone, gypsum, and other rocks by dissolution and that is characterized by sinkholes, caves, and underground drainage.

Lacustrine – Sedimentary rock formations that formed in the bottom of ancient lakes.

Land cover – Material found covering the surface of the earth; may originate from natural or anthropogenic sources.

Lens – A body of ore or rock that is thick in the middle and thin at the edges, resembling a convex lens in cross section. Lenses often fill shallow local depressions in underlying gravel.

Lifecycle phase – The lifecycle phases identified for the GMPEF are construction, operation, and decontamination and decommissioning (D&D).

Limestone – Sedimentary rock composed largely of mineral calcite ($CaCO_3$) formed by either organic or inorganic processes.

Lineament – A straight topographic feature of regional extent that is thought to represent a crustal structure such as an underlying fault.

Liquefaction – A phenomenon in which the strength and stiffness of a soil is reduced by earthquake shaking. Liquefaction occurs in saturated soils (i.e., soils in which the space between individual particles is completely filled with water). Liquefaction of soils near the ground surface could result in a bearing capacity failure of foundations. If the soils are deep, then liquefaction is unlikely to cause failure, but could result in significant settlements from the dissipation of earthquake-induced pore pressures.

Liquid limit – The moisture content at the transition from plastic to liquid state. The liquid limit provides a measure of the moisture content of a soil based on its performance during a standard laboratory test. It is one of the Atterberg limits measured on fine-grained soils.

Loam – A rich, friable soil containing a relatively equal mixture of sand and silt and a somewhat smaller proportion of clay.

Loess – A loosely compacted yellowish-gray deposit of windblown sediment of which extensive deposits occur.

Logs (well/boring) – The record of, or the process of recording, events or the type and characteristics of the rock penetrated in drilling a borehole, as evidenced by the cuttings, core recovered, or information obtained from electric, sonic, or radioactivity devices.

Low-Level Radioactive Waste (LLRW) – Materials that have become contaminated with radioactive material or have become radioactive through exposure to neutron radiation. This waste typically consists of contaminated personal protective equipment (e.g., protective shoe covers and clothing), wiping rags, mops, filters, radioactive water treatment residues, and equipment and tools.

Major Source – Term used to determine the applicability of permitting regulations to specific sources. What constitutes a major source varies according to what type of permit is involved, the pollutant(s) being emitted, and the attainment designation of the area where the source is located. In general, a source is major if its emissions exceed certain thresholds that are defined in terms of tons per year. For example, under Title V of the Clean Air Act, a major source is any source that emits or has the potential to emit 100 tons per year or more of any criteria air pollutant or any source that emits or has the potential to emit 10 tons per year or more of any HAP, or 25 tons per year or more of a mixture of HAPs.

Marl – A friable, earthy deposit consisting of clay and calcium carbonate.

Maximally exposed individual (MEI) – A hypothetical person living at the point of highest projected constituent concentrations near the property boundary. The MEI is the location assessed to have the greatest potential offsite impact, regardless of whether an individual currently occupies the location or is likely in the future to occupy the location.

Micaceous – Consisting of or containing mica; a group of phyllosilicate minerals.

Microburst – An intense downburst of cool air from a thunderstorm that causes localized (within 2.5 miles [4 kilometers]), damaging, straight-line winds when it reaches the ground and is forced to flow horizontally. Microbursts are caused by rain evaporating inside the thunderstorm, and thereby cooling the air, which becomes dense and quickly sinks.

Microphone – A very sensitive device used to convert sound-pressure levels into electrical signals that can be recorded by an environmental noise monitor.

Miocene – An epoch of the later Tertiary period, after the Oligocene and before the Pliocene.

Mixed Waste – A type of waste that contains both hazardous and radioactive source, special nuclear, or by-product material, as defined by the Atomic Energy Act. In this document, it refers to mixed low-level radioactive waste.

Mixing Height – The height above the surface of Earth through which relatively vigorous vertical mixing occurs. This is an important parameter in determining the vertical spread of a chemical plume in the atmosphere.

Metropolitan Statistical Area (MSA) – A geographic entity that is defined by the U.S. Office of Management and Budget (OMB) for use by Federal statistical agencies in collecting, tabulating, and publishing Federal statistics. Each MSA consists of one or more counties and includes the counties containing the core urban area, as well as any adjacent counties that have a high degree of social and economic integration (as measured by commuting to work) with the urban core.

Mollusk – Any invertebrate of the phylum Mollusca, typically having a calcareous shell of one, two, or more pieces that wholly or partly enclose the soft, unsegmented body of the creature; includes chitons, snails, bivalves, squids, and octopuses.

Multi-Criteria Decision Analysis (MCDA) – MCDA is a family of mathematically based methods and procedures that provide a comprehensive and rational framework for structuring both tangible and intangible elements of a complex decision problem, for representing and quantifying its elements, for relating those elements to overall goals, and for evaluating alternative solutions.

Multi-family structure – A land parcel that contains three or more dwelling units on a lot in common ownership, such as apartment buildings, condominiums, or mobile home parks.

Municipal Solid Waste (MSW) – Discarded durable goods, non-durable goods, paper, cardboard, containers and packaging, plastics, metals, food wastes, yard trimmings, and miscellaneous inorganic wastes.

Municipality – A political unit, such as a city, town, or village, incorporated for local self-government.

MWe (**megawatt electric**) – A measurement of the rate of energy output of a nuclear power plant (1 MWe equals 1 million watts of electricity).

NAAQS – Air quality standards that the EPA is required to promulgate under the Clean Air Act Amendments of 1990 for criteria pollutants (i.e., not toxic pollutants) considered harmful to human health and the environment. These standards apply to carbon monoxide, lead, nitrogen dioxide, particulate matter with aerodynamic diameter of 2.5 micrometer (μm) ($PM_{2.5}$), ozone, and sulfur oxides.

National Emission Standards for Hazardous Air Pollutants (NESHAP) – Emission standards applicable nationwide that are established by the EPA for HAPs.

National Pollutant Discharge Elimination System (NPDES) – EPA surface water quality program authorized by Congress as part of the 1987 CWA to control the discharge of pollutants to Waters of the United States (40 CFR 122.2).

Natural Resources Conservation Service – An organization within the U.S. Department of Agriculture aimed at helping America's private landowners and managers conserve their soil, water, and other natural resources.

Neotectonism – The study of the motions and deformations of Earth's crust that are current or recent in geologic time.

Nighttime Hours – Hours between 10:00 p.m. and 7:00 a.m.

Non-attainment area – An area in which the maximum allowable air concentration of a given pollutant has been reached; therefore, additional releases of the pollutant are not permitted.

Non-consumptive surface water use – The use of water in a way that does not significantly reduce the quantity or quality of the water source. This means that the water is either not withdrawn from the source or, if it is withdrawn, it is returned to the source without substantial loss or degradation.

Nuclide – A species of atom characterized by the constitution of its nucleus. The nuclear constitution is specified by the number of protons, number of neutrons, and energy content or, alternatively, by the atomic number, mass number, and atomic mass.

N-value – The result of a standard penetration test (SPT) performed according to ASTM D1586. The N-value is measured as the number of blows to drive the SPT sampler the final 12 inches of the 18 inches it is driven. This value is used to estimate soil properties by empirical correlations for use in geotechnical analyses.

Offsite – Area outside the property boundary (or outside the fence line) of a facility.

Onsite – Area inside the property boundary (or inside the fence line) of a facility.

Paducah Gaseous Diffusion Plant (PGDP) – The Paducah Gaseous Diffusion Plant. Now known as the Paducah Site.

Paleocene – Noting or pertaining to an epoch of the Tertiary period, from 65 to 55 million years ago, and characterized by a proliferation of mammals.

Parcel – A piece of land that can be owned, sold, and developed.

Peak ground acceleration – The maximum acceleration experienced by the particle on the ground during the course of the earthquake motion.

Permeability – The ability of a porous rock, sediment, or soil to transmit fluids.

Physiography – The science of physical geography; (formerly) geomorphology.

Plasticity index – The difference between the liquid limit and the plastic limit measured for a fine-grained soil sample. The plasticity of soil is caused by the adsorbed water that surrounds the clay particles. The type of clay material and their proportional amounts in a soil will affect the liquid and plastic limits.

Pleistocene – Noting or pertaining to the epoch forming the earlier half of the Quaternary period, beginning about 1.75 million years ago and ending 11,500 years ago, characterized by widespread glacial ice and the advent of modern humans.

Pliocene – Noting or pertaining to an epoch of the Tertiary period, occurring from 5 to 1.75 million years ago and characterized by the increased size and numbers of mammals, by the growth of mountains, and by global climatic cooling.

PM_{10} – Particulate matter with aerodynamic diameter of 10 μm or less. PM_{10} includes $PM_{2.5}$.

$PM_{2.5}$ – Particulate matter with aerodynamic diameter of 2.5 μm or less. Since it is very small, $PM_{2.5}$ is important because it can be inhaled deep into the lungs.

Polar Front – The boundary of colder polar air and warmer tropical air that is found at Earth's surface.

Potable water – Water that is safe for human consumption.

Potentiometric surface – The level to which the groundwater would rise in a well if unaffected by friction with the surrounding rocks and sediments under unconfined conditions — includes the pressure and elevation head.

Precambrian – All geologic time and its corresponding rocks before the beginning of the Paleozoic era, equal to about 90 percent of geologic time. The Precambrian ended 570 million years ago, during which Earth's crust formed, and life first appeared in the seas.

Preferred site – The site that emerges from the site-selection process, after the qualitative cost-benefit analysis, to determine if there is an "obviously superior" site to the proposed site.

Primordial radionuclides – Radionuclides left over from when Earth and the universe were created.

Progeny – The decay product or products resulting after a radioactive decay or a series of radioactive decays. The progeny can also be radioactive, and the chain continues until a stable nuclide is formed.

Proof roll – An evaluation of subgrade soil conditions by driving a loaded, rubber-tired dump truck over an area and having an engineer observe the action of the wheels on the subgrade soils to evaluate their condition and to recommend required repairs.

Proposed Action – The construction and operation of a uranium-enrichment facility at the GMPEF Site in accordance with the Atomic Energy Act of 1954, as amended; 10 CFR 70; and other applicable laws and regulations.

Proposed site – A desirable location where the applicant would like to place the facility for business and other considerations.

Quartz – A silicate mineral (i.e., silicon dioxide) composed exclusively of silicon-oxygen tetrahedra, with all oxygens joined in a three-dimensional network.

Quaternary – Noting or pertaining to the present period of Earth's history, forming the latter part of the Cenozoic era, originating about 2 million years ago and including the Recent and Pleistocene epochs.

Radiation – Refers to the process of emitting energy in the form of rays or particles that are released by disintegrating atoms. The NRC is responsible for regulating and licensing the use and possession of certain radioactive materials and the resulting radiation from byproduct and special nuclear materials.

Radioactivity – A property possessed by some elements, such as uranium, whereby alpha, beta, or gamma rays are spontaneously emitted.

Radionuclide – A radioactive atomic nuclide, which is an atomic nucleus specified by atomic weight, atomic number, and energy state.

Rare – Species listed as threatened, endangered, or other special concern by the State or Federal government.

Receptor – In air dispersion modeling, refers to a location for which concentration and deposition values will be calculated by the model.

Region – Refers to the geographic area surrounding the GMPEF Project Area; limited to areas at the county level or greater (geographic area that is larger than vicinity). This term is used differently in various sections of the Environmental Report, and section-specific descriptions are included in the report for clarification.

Region (socioeconomic) – The relevant region is limited to that area necessary to include social and economic base data for (1) the county in which the Proposed GMPEF Site would be located; and (2) those specific portions of surrounding counties and urbanized areas from which the construction/refurbishment work force would be principally drawn, or that would receive stresses to community services by a change of residence of construction/refurbishment/decommissioning workers. Other social and economic impacts can generally be presumed to fall within the same area covered by this definition of the region. For this study, the socioeconomic region is defined as McCracken and Ballard Counties in Kentucky.

Relief – A term used loosely for the physical shape, configuration, or general unevenness of a part of Earth's surface, considered with reference to variations of height and slope or to irregularities of the land surface; the elevations or differences in elevation, considered collectively, of a land surface.

Rem – Special unit of any of the quantities expressed as dose equivalent equal to the absorbed dose in rads (rad is the special unit of absorbed dose) multiplied by the quality factor (10 CFR 20.1004).

Rift – A linear zone where the lithosphere is being pulled apart. Rifting often makes a rift valley, which may hold a rift lake.

Riparian – The land adjacent to the banks or the banks of any river or stream.

Riparian area – An area that is adjacent to a body of water.

Russian "Suspension Agreement" – A program under which Russia is allowed to sell uranium in the United States.

Sanitary waste – Liquid or solid wastes originating solely from humans and human activities, such as wastes collected from toilets, showers, wash basins, sinks used for cleaning domestic areas, sinks used for food preparation, clothes-washing operations, and sinks or washing machines where food and beverage serving dishes, glasses, and utensils are cleaned.

Screening – A systematic process of evaluating criteria in increasing levels of detail to distinguish characteristics of a choice; also referred to as screening step. Used in the site-selection process to eliminate a site after it fails to meet certain criteria. Depending on the level of scrutiny, screening is expressed at initial, coarse, or fine screening.

Sedimentary – Formed by the deposition of sediment or pertaining to the process of sedimentation. Sedimentary rock results from the consolidation and cementation of loose sediment that has accumulated in layers.

Seismicity – Measure of frequency and magnitudes of earthquakes in a given area.

Semi-confining layer (or unit) – A lower-permeability layer between two or more permeable water-bearing units that restricts vertical flow between the units. A semi-confining layer is relatively more permeable than a confining layer.

Semi-permanent – In meteorology, refers to an atmospheric feature, such as a high, which persists for long periods of time and can be expected to occur regularly.

Separative Work Units (SWUs) – Units of measurement of the effort needed to separate uranium-235 from uranium-238. SWUs are computed using a standard formula derived from the physics of uranium enrichment.

Shear wave velocity – The velocity of seismic waves transmitted through the ground by particles vibrating perpendicular to the direction of wave travel.

Shovel testing – The controlled excavation of 30-centimeter diameter holes and the screening of the removed sediment for the presence or absence of cultural material. This testing is typically conducted on a grid aligned to cardinal directions or landform shape.

Single-family homes – Land parcels with single-family, detached, small-lot single-family, or two-family residential uses.

Sinkhole – Depression in surface of the ground caused by the collapse of the roof over a solution cavern.

Special Nuclear Material (SNM) – Nuclear material (e.g., plutonium, uranium-233, or uranium) enriched in the isotopes uranium-233 or uranium-235.

Soil Survey Geographic (SSURGO) Database – The most detailed level of soil mapping done by the Natural Resources Conservation Service. Field-mapping methods using national standards were used to construct the soil maps in the SSURGO database, with scales generally ranging from 1:12,000 to 1:63,360. SSURGO digitizing duplicates the original soil survey maps. This level of mapping is designed for use by landowners, townships, and county natural resource planning and management. SSURGO data are available for selected counties and areas throughout the United States and its territories. SSURGO is linked to a National Soil Information System attribute database. The National Soil Information System database gives the proportionate extent of the component soils and their properties for each map unit. The SSURGO map units consist of 1 to 3 components each. The map extent for a SSURGO dataset is a soil survey area, which may consist of a county, multiple counties, or parts of multiple counties (USDA NRCS, 2026a).

Stability – A property of the atmosphere that suppresses mixing. The main parameter determining stability is the vertical temperature profile of the atmosphere.

Stability Class – A letter code indicating the degree of atmospheric stability. Stability Class A refers to the most unstable atmospheric conditions, with strong mixing, and Stability Class F refers to the most stable atmospheric conditions, with little mixing. Stability Class D is considered stable.

Standard Penetration Test – An in-situ soil test used to characterize geotechnical aspects of a soil, such as approximate soil strength parameters and relative density of granular deposits. Penetration test performed at selected depths in a soil test boring by driving a split-barrel sampler a distance of 18 inches using a 140-pound hammer dropping a distance of 30 inches. Procedure described in ASTM D1586.

Stormwater – The flow of water that results from precipitation and that occurs immediately following rainfall or as a result of snowmelt.

Stratigraphy – The science of rock strata; concerned not only with the original succession and age relations of rock strata, but also with their form, distribution, lithologic composition, fossil content, and geophysical and geochemical properties.

Strike – Direction of line formed by intersection of a rock surface with a horizontal plane.

Structure (geological) – Attitudes of deformed masses of rock.

Subsidence – The lowering of Earth's surface, caused by such factors as compaction, a decrease in groundwater levels, or the pumping of oil.

Surface water – All waters collected above ground level, including rivers, lakes, streams, ponds, and wetlands.

Surficial aquifer – Water-borne unconsolidated and residual deposits occurring on or near Earth's surface, generally unstratified and representing the most recent of geologic deposits.

Sv – As defined by the International System of Units, the unit of radiation dose equivalent, equal to 1 joule of energy per kilogram of absorbing tissue. The sievert replaces the rem (1 Sv = 100 rem).

Syncline – A type of fold in structural geology where the younger layers of rock are closer to the center of the fold structure.

Synoptic – In meteorology, the large-scale weather pattern, including the large-scale highs, lows, and fronts that are depicted on a typical national weather map.

Terrace – Nearly level surface, relatively narrow, bordering a stream or body of water and terminating in a steep bank. Commonly, term is modified to indicate origin, as in stream terrace and wave-cut terrace.

Tertiary – The first period of the Cenozoic era (after the Cretaceous period of the Mesozoic era and before the Quaternary period), thought to have covered the span of time between 65 million years and 3 to 2 million years ago. The Tertiary period is divided into five epochs: the Paleocene, Eocene, Oligocene, Miocene, and Pliocene.

Threatened – Any species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range within the state, or any species determined to be a "threatened species" pursuant to the Endangered Species Act.

Topographic – The representation of a land surface, including its relief and the position of its natural and man-made features.

Topography – The shape of Earth's surface or the geometry of landforms in a geographic area.

Topsoil – The fertile, surface portion of a soil; usually dark colored and rich in organic material.

Total Effective Dose Equivalent (TEDE) – The sum of the deep-dose equivalent (DDE) (for external exposures) and the CEDE (for internal exposures) (DDE + CEDE = TEDE).

Toxic Air Pollutant (TAP) – Those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects.

Transmissivity – A measure of the permeability of a porous medium that reflects the aquifer thickness. Transmissivity thus reflects the overall water-bearing potential of a porous medium.

Travel corridor – Pathways that animals use to travel from one location to another to acquire resources.

Tributary – A stream that supplies water to a larger stream.

UF_6 – Uranium hexafluoride; a conversion product of U_3O_8, also known as "yellow cake," which is produced by mining and milling uranium ore. The UF_6 is then enriched before being made into nuclear fuel.

UF_6 feed – Natural uranium in the form of UF_6 suitable for enrichment.

UF_6 product – UF_6 that contains a higher concentration of the uranium-235 isotope as a result of the enrichment process.

UF_6 tails – UF_6 that contains a lower concentration of the uranium-235 isotope as a result of the enrichment process. Also known as depleted uranium (DU).

Understory – Any vegetation that grows beneath the canopy layer; sub-canopy.

Undifferentiated (geological materials) – Geologic deposits that have not been mapped in detail and are typically a complex mixture of units with different geologic history.

Vicinity – Refers to a geographic area close to the GMPEF Project Area; usually describes features within 1 to 2 miles of the Site but may extend to a specific radius that is less than countywide (smaller geographic area than "region").

Viewshed – The area on the ground that is visible from a specific location.

Water quality standards – Water quality goals for specific waterbodies that are adopted by states and approved by the EPA to comply with the CWA.

Waters of the United States (or jurisdictional waters) – All waters that are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide (33 CFR 328.3). Includes lakes, rivers, streams, and wetlands.

Wetlands – Areas that are inundated or saturated by surface waters or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (33 CFR 328.3).

Wind Rose – A plot of wind direction and speed showing the distribution of directions that the wind blows from at a measurement site. The proportion of the time that a wind blows from any given direction is indicated by the length of the "petal" on the wind rose.

Wind Speed – The speed of air movement measured for a set height above ground level (agl) at a meteorological observing site. This height may vary depending on the location. Typically, anemometers at National Weather Service stations are placed at 32 feet 10 inches agl; however, some are still found at 20 feet agl.

Windscreen – A foam device inserted over a microphone to reduce the exposure of the microphone to winds that might create increased sound levels.

Zoning – A designation and reservation under a master plan of land use for light and heavy industry, dwellings, offices, and other buildings; use is enforced by restrictions on types of buildings in each zone.

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10.0 LIST OF PREPARERS

This chapter identifies organizations and individuals who contributed to the overall effort of producing this Environmental Report.

10.1 Project Managers

ERNEST HARR, LEIDOS

RESPONSIBILITIES: PROJECT MANAGER

Education: B.S., Zoology, University of Maryland

Experience/Technical Specialty:

Forty years. NEPA analysis; radiological analyses – normal operation, accidents and intentionally destructive acts; human health and safety – worker and public; radioactive and mixed waste management; transportation – radiological and nonradiological; remediation; decontamination and decommissioning; and regulatory and compliance analyses.

SARAH BRESNAN RAUCH, CSE, LEIDOS

RESPONSIBILITIES: DEPUTY PROJECT MANAGER / ECOLOGICAL RESOURCES

Education: B.S., Plant Biology Environmental Science and Ecology, Arizona State University

Experience/Technical Specialty:

Twenty years. Certified Senior Ecologist (CSE), environmental permitting, regulatory compliance and assessment, NEPA reviews, natural resources fieldwork, and research.

10.2 Subject Matter Experts

JAY AUSTIN, LEIDOS

RESPONSIBILITIES: NOISE AND VIBRATION, GEOLOGY AND SOILS

Education: M.S., Environmental Science, Christopher Newport University, 2011
B.A., Biology, University of Virginia, 1999

Experience/Technical Specialty:

Twenty-six years. NEPA analysis covering resource areas including noise and vibration (industrial, transportation, and other sources) as well as geology and soils. Mitigation development for community impacts reduction and compliance with applicable regulations and guidelines.

CHRIS CRABTREE, LEIDOS

RESPONSIBILITIES: METEOROLOGY, CLIMATOLOGY, AND AIR QUALITY

Education: B.A., Environmental Studies, University of California Santa Barbara

Experience/Technical Specialty:

Thirty-six years. Source emission quantifications, dispersion modeling, health risk assessments, greenhouse gas and climate change analyses, mitigation evaluations, determination of project compliance with air pollution standards and regulations, including NEPA, General Conformity, CEQA, and state and regional air pollution agencies.

MELANIE FOX, LEIDOS

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JASON KORALEWSKI, LEIDOS

RESPONSIBILITIES: HISTORICAL AND CULTURAL RESOURCES

Education: M.A., Anthropology, The Ohio State University
M.L.S., Liberal Studies, spec. Archaeology, The University of Toledo
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Experience/Technical Specialty:

Thirty years. Prehistoric and historic archaeology fieldwork and research, direct and indirect impact analysis of cultural resources, Native American and agency consultations, NEPA project management and environmental consequence analysis, geological analysis, archaeological predictive modeling.

MIRANDA LAWSON, LEIDOS

RESPONSIBILITIES: APPLICABLE REGULATORY REQUIREMENTS, PERMITS, AND REQUIRED CONSULTATIONS / MITIGATION MEASURES

Education: B.S., Environment and Sustainability Sciences, Cornell University

Experience/Technical Specialty:

Three years. Environmental health and safety protocols, sustainable packaging, alternative fuels, environmental justice, energy justice, and climate change perspectives, public outreach, NEPA and Formerly Utilized Sites Remedial Action Program (FUSRAP) support.

DOUGLAS A. OUTLAW, LEIDOS

RESPONSIBILITIES: PUBLIC AND OCCUPATIONAL HEALTH

Education: Ph.D., Physics, North Carolina State University
M.S., Nuclear Physics, North Carolina State University
B.S., Nuclear Physics, North Carolina State University

Experience/Technical Specialty:

Forty-six years. NEPA project management and analysis, nuclear physics, safety analysis, and risk assessment.

GEORGE SANTEE, LEIDOS

RESPONSIBILITIES: MARKET ANALYSIS FOR ENRICHED URANIUM / ENVIRONMENTAL MEASUREMENTS AND MONITORING PROGRAMS

Education: M.S., Nuclear Science and Engineering, Idaho State University
B.S., Applied Physics, Idaho State University

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Forty-three years. Safety and risk analysis, radiological and hazardous material consequence analysis, nuclear safety, regulatory compliance, health and safety assessment.

CHRISTOPHER VAN HOOK, LEIDOS

RESPONSIBILITIES: GRAPHICS

Education: Four years toward BFA in graphic design

Experience/Technical Specialty:

Thirty-eight years. Graphic designer specializing in Adobe Creative Suite software.

JENNIFER WALLIN, LEIDOS

RESPONSIBILITIES: REFERENCES

Education: M.S., Environmental Toxicology, Clemson University
B.A., Biology, Pacific Lutheran University

Experience/Technical Specialty:

Twenty-five years. Environmental Impact Statements, Environmental Assessments, Biological Assessments, Coastal Zone Consistency Determinations, and Essential Fish Habitat Assessments; aquatic ecology and toxicology; technical writing, technical review, and technical editing; document production and references management; Administrative Record management for NEPA projects.

JESSICA WELSH, LEIDOS

RESPONSIBILITIES: EDITING

Education: B.A., Journalism, The College of New Jersey

Experience/Technical Specialty:

Twenty-six years. Proofreading, editing, formatting, and document production.

CHRISTOPHER WOODS, LEIDOS

RESPONSIBILITIES: GEOGRAPHIC INFORMATION SYSTEMS

Education: B.A., Geography, University of Western Ontario

Experience/Technical Specialty:

Twenty-seven years. Cartographic map production, spatial data analytics, field data collection, GIS development and customization.

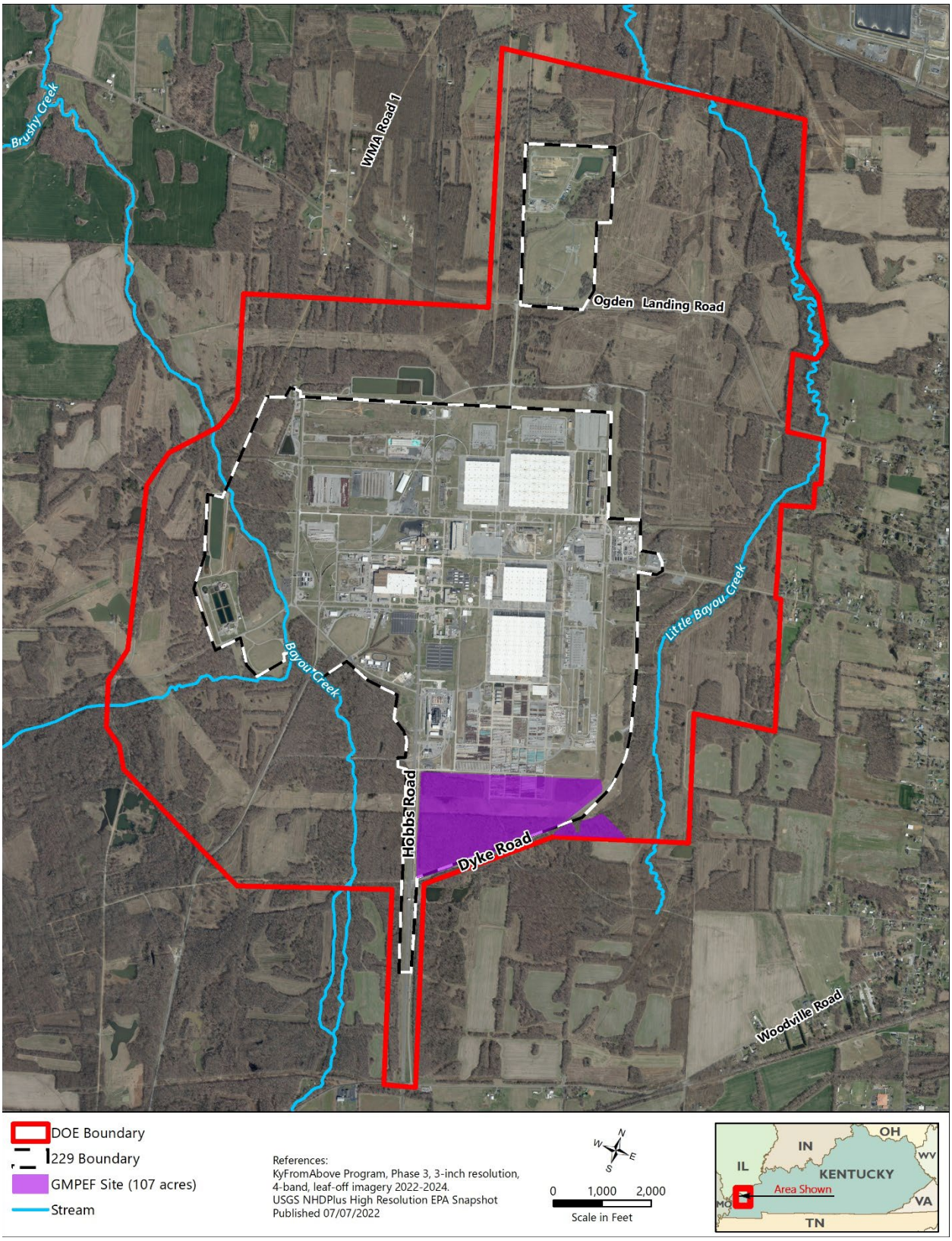
APPENDIX A
FACILITY DESCRIPTION

A-1. Site Location

The site proposed for the General Matter Paducah Enrichment Facility (GMPEF) is situated on approximately 107 acres of land leased from the Department of Energy (DOE) Paducah Site. This site includes the entirety of Leasing Parcel A (approximately 100 acres) and 6.8 acres of Leasing Parcel C (188 acres). A Categorical Exclusion (CX) was issued on July 3, 2025, for the *Lease of Real Property (Leasing Parcel A) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (CX-270990).* This CX evaluated the action of leasing 100 acres of real property of the Paducah Gaseous Diffusion Plant (PGDP) to General Matter, Inc. (GeM). GeM is currently in negotiations with DOE-Portsmouth/Paducah Project Office for the lease of Leasing Parcel C, the real property transfer of which was evaluated in the *Lease of Real Property (Leasing Parcel C) at the Paducah Gaseous Diffusion Plant (CX-270955)*.

These tracts of land will be referred to as the GeM Land Parcel or GMPEF Site throughout the remainder of this document. The GeM Land Parcel spans between latitudes (North) 37° 5' 48.9" and 37° 6' 13.8", and between longitudes (West) 88° 49' 10.9” and 88° 48' 20.5". It is located approximately 10 miles west of Paducah in McCracken County, Kentucky (Figure A-1). The GeM Land Parcel contains an approximately 10-acre uranium hexafluoride (UF_6) cylinder storage yard (C-745-T Cylinder Storage Yard), a high-voltage transmission line right-of-way, and is bordered by the following:

- North: The industrial core of the Paducah Site. A depleted uranium hexafluoride (DUF_6) conversion facility operated by Mission Conversion Services Alliance, LLC, is also located on the Paducah Site.
- East: Dyke Road. East of Dyke Road is a forest area of the DOE Paducah Site that was previously utilized as part of the West Kentucky Wildlife Management Area (WKWMA). Following recent land transfers, future use of the area would include industrial uses.
- South: Dyke Road. South of Dyke Road is approximately 691 acres of property owned by Global Laser Enrichment, LLC (GLE). GLE plans to construct and operate the Paducah Laser Enrichment Facility (PLEF) at this location. This area consists of forested and former agricultural fields that were formerly part of the WKWMA.
- West: Hobbs Road is a potential option for an access road to the Paducah Site. West of Hobbs Road is a portion of the DOE Paducah Site that consists of mostly forested land that was previously licensed to Kentucky as part of the WKWMA. Following recent land transfers, future use of the area would include industrial uses.



Source: (DOE, 2025a)

Figure A-1: General Matter Paducah Enrichment Facility Site

A-2. Enrichment Process

[redacted] (Trade Secret / Confidential Commercial Information)

- The feedstock for the enrichment process is UF_6. UF_6 with U-235 content below the naturally occurring level (0.711 percent weight/total [w/t]) is referred to as DUF_6. UF_6 with U-235 content above 1 percent w/t is referred to as enriched UF_6.
- The GMPEF will receive DUF_6 cylinders from the DOE Paducah Site and may also receive DUF_6 from other enrichment facilities, as well as UF_6 with a natural composition of uranium-234, U-235, and uranium-238 isotopes. Feedstock from facilities other than the PGDP would be received via the American National Standards Institute (or ANSI) N14.1 compliant transportation cylinders (e.g., 48Y cylinders).
- DUF_6 cylinders from the PGDP would be transferred from DOE to the GMPEF at a transfer point adjacent to the existing cylinder storage yard. Cylinders received from off site would enter via the security gate and then be offloaded onto one of the UF_6 pads for storage for future use or transported directly into the UF_6 handling area of the enrichment buildings for immediate use.

[redacted] (Trade Secret / Confidential Commercial Information)

- Enriched product would be collected into 48-inch or 30-inch cylinders depending on output. The GMPEF would enrich DUF_6 to produce natural assay UF_6 and UF_6 enriched to 1 percent U-235. The GMPEF would also enrich UF_6 to produce low-enriched uranium (LEU) (up to 5 percent U-235) and high-assay, low-enriched uranium (HALEU) (up to 20 percent U-235).
- Filled cylinders would either be transferred to onsite storage yards or loaded onto trucks for transport to offsite facilities for further processing. UF_6 transported off site would be contained in ANSI N14.1-compliant transportation cylinders. DUF_6 that is not designated for further enrichment would either be returned to the PGDP or stored on site.

A-3. Production Capacity

The GMPEF would have the capacity to enrich several million Separative Work Units across both Production Hall A and Production Hall B.

A-4. Facility Description

The GMPEF footprint fills most of the 107-acre site. Within the Conceptual Site Plan footprint (see Figure A-2), there would be uranium enrichment buildings, an administrative building and other support buildings, a parking lot, UF_6 cylinder storage pads, maintained landscaped areas, and a switchyard (also see Figure A-3). The uranium enrichment buildings are identified as Production Hall A and Production Hall B. Startup of the GMPEF will be implemented in a phased manner to allow operations to commence as individual facilities, systems, processes, and items relied on for safety become operational.

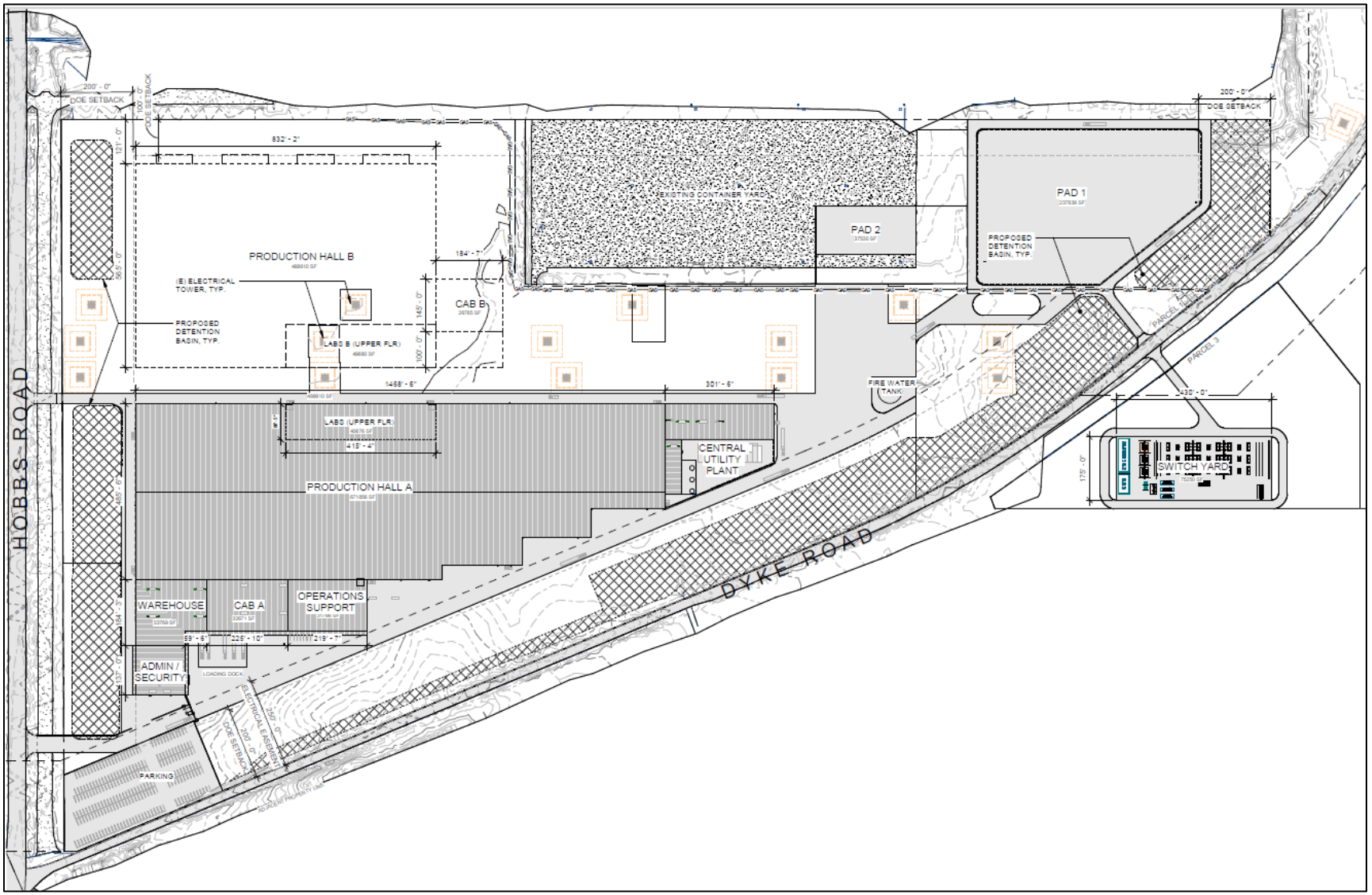


Figure A-2: General Matter Paducah Enrichment Facility Conceptual Site Plan



Figure A-3: Rendering of Facilities at the General Matter Paducah Enrichment Facility Site

The buildings and structures that comprise the GMPEF are described below:

- Administrative and Security Building
- Two floors and approximately 36,000 square feet (ft)
- Administrative and Security Building would contain the following support functions:
  - Office and conference spaces for facility employees.
  - Restrooms.
  - Break room.
  - Information technology (IT) and electrical room.
  - Training.
  - Badging office.
  - Access controls to control personnel movement in and out of secure areas of the facility.
  - Security alarm and monitoring facilities.
  - Fire command center.
  - Parking areas adjacent to buildings.
- Warehouse Building
  - Approximately 32,000 square ft
  - The general Warehouse Building would have a truck bay and provide areas for shipping and receiving aside from those deliveries that would be made directly to the Component Assembly Building. The Warehouse Building would be divided into two sections, storing separately both secure and non-secure non-radiological equipment and materials.
- Component Assembly Buildings
  - Two buildings, totaling approximately 32,000 square ft each
  - Both would contain the following spaces:
    - [redacted] (Trade Secret / Confidential Commercial Information)
    - [redacted] (Trade Secret / Confidential Commercial Information)
    - [redacted] (Trade Secret / Confidential Commercial Information)
    - [redacted] (Trade Secret / Confidential Commercial Information)
- Operations Support
  - Approximately 35,000 square ft
  - The Operations Support Building would contain the following support functions:
    - Offices and training areas for radiological operations employees.
    - Emergency Operations Center that doubles as a break room.
    - Meeting rooms.
    - Control Center, containing a Control Room to serve as the main point of monitoring and control for enrichment buildings. The Control Room would contain control workstations with desks and screens, fire and safety alarm systems, and communications systems. The Control Center would also include training rooms and classified IT spaces.
    - Radiation Control Point and Monitoring Room to be used for contamination monitoring equipment, handwashing facilities, safety showers, and access controls to separate non-contaminated and potentially contaminated areas of the facility.

- Labs (Materials Testing and Equipment, Calibration, and Tool Crib).
- Workshops (Electrical Shop, Instruments and Control Shop, and Mechanical Maintenance Shop).

- Production Hall A
  - Approximately 650,000 square ft.
  - [redacted] (Trade Secret / Confidential Commercial Information)
  - The Product (UF_6) Handling Area would include feedstock, product, and tails take-off systems, hot and cold boxes, scales, and the UF6 cylinder transportation system.
  - The Process Services Corridors would contain electrical equipment, piping, and pumping equipment required to support operation of units.
  - Container (Cylinder) Handling area includes a Cylinder Repair shop for maintenance and refurbishment of UF_6 cylinders, overhead gantry cranes for safe movement and positioning of cylinders, a loading area designed for trucks to back into for efficient transfer operations, and dedicated spaces for cylinder staging and preparation to support the facility's material handling operations.
  - Lab (Radiological) Support Area, approximately 35,000 square ft, is located above the UF_6 Handling area within the Production Halls, accessed via two freight elevators, and contains the following functions:
    - Chemistry Lab to perform sampling and analysis for process materials, including mass spectrometry.
    - Low-Level Radioactive Waste Storage Room to collect and store solid waste.
    - Gaseous Effluent Ventilation System.
    - One [redacted] (Trade Secret / Confidential Commercial Information) and Local Gaseous Effluent Ventilation System per unit.
  - Mechanical Rooms, totaling approximately 100,000 square ft, flank the Radiological Support Area on the upper floor of Production Hall A to support functions within the building.
  - Service Corridor for access from Component Assembly Buildings to units for [redacted] (Trade Secret / Confidential Commercial Information)
- Production Hall B
  - Approximately 490,000 square ft
  - Production Hall B contains the same components described for Production Hall A.
- Cylinder Storage Pads
  - Approximately 280,000 square ft total
  - The facility would have several concrete pads for storing approximately 7,000 cylinders. These would be used to store 48" and 30" cylinders containing feedstock, product, and tails.
    - Pad 1, a 240,000-square-ft cylinder pad, will provide storage for cylinders for feeds and tails, including an isolated area for cylinder cool down.
    - Pad 2, a 40,000-square-ft cylinder pad, anticipated to be built on a portion of the existing T-Yard will hold Special Nuclear Materials product in 30B cylinders.
- Central Utilities Building

  - Approximately 27,000 square ft
  - The Central Utilities Building would contain the following support functions:
    - A pad for a Modular HVAC Plant.
    - Primary Electrical Room and distribution from the switchyard.
    - Pad for compressed air, liquid nitrogen, and argon.
- Switchyard
  - Approximately 94,000 square ft, located in Parcel C expected to be leased from DOE in the third quarter of 2026.
  - Outdoor area containing electrical equipment where utility interconnection feeds facility electrical equipment in the Central Utilities Building.
    - Diesel generators for backup power generation.

A-5. Utility Connections

The following utility connections would be needed:

- Connection to the existing DOE Paducah Site water distribution system supply line on Hobbs Road or available municipal water sources near the DOE Paducah Site.
- Connection to the existing DOE Paducah Site sanitary sewer line on Hobbs Road or available municipal sewer near the DOE Paducah Site.
- Connection to the DOE natural gas line south of the cylinder storage yard. Natural gas supplied by Atmos Energy.
- Connection to electrical lines at the new GMPEF substation. [redacted] (Trade Secret / Confidential Commercial Information)

Figure A-4 shows the location of the existing utility infrastructure.

A-6. Schedule

The GMPEF Site is expected to require less than 1 year for preparation and 2 years for construction. The GMPEF would be initially licensed for 40 years of operation and subsequently receive up to two 20-year license renewal periods or be decommissioned. The following is a tentative list of Proposed Action milestones:

- 2025 and 2026 – Site clearing and preparation, utility install, and grading/earthwork
- 2026 – Pre-construction start (for facilities with no nexus to radiological safety)
- 2026 – Submit Nuclear Regulatory Commission (NRC) Part 70 license application
- 2027 – NRC license issuance
- 2028 – Initial Construction Completion
- 2028 – Commissioning of Production Hall A
- 2029 – Commissioning of Production Hall B
- 2067 – End of initial 40-year license
  - 2067 to 2069 – Decontamination and decommissioning (D&D)
- If license renewed: 2107 – End of renewal term
  - 2107 to 2109 – D&D

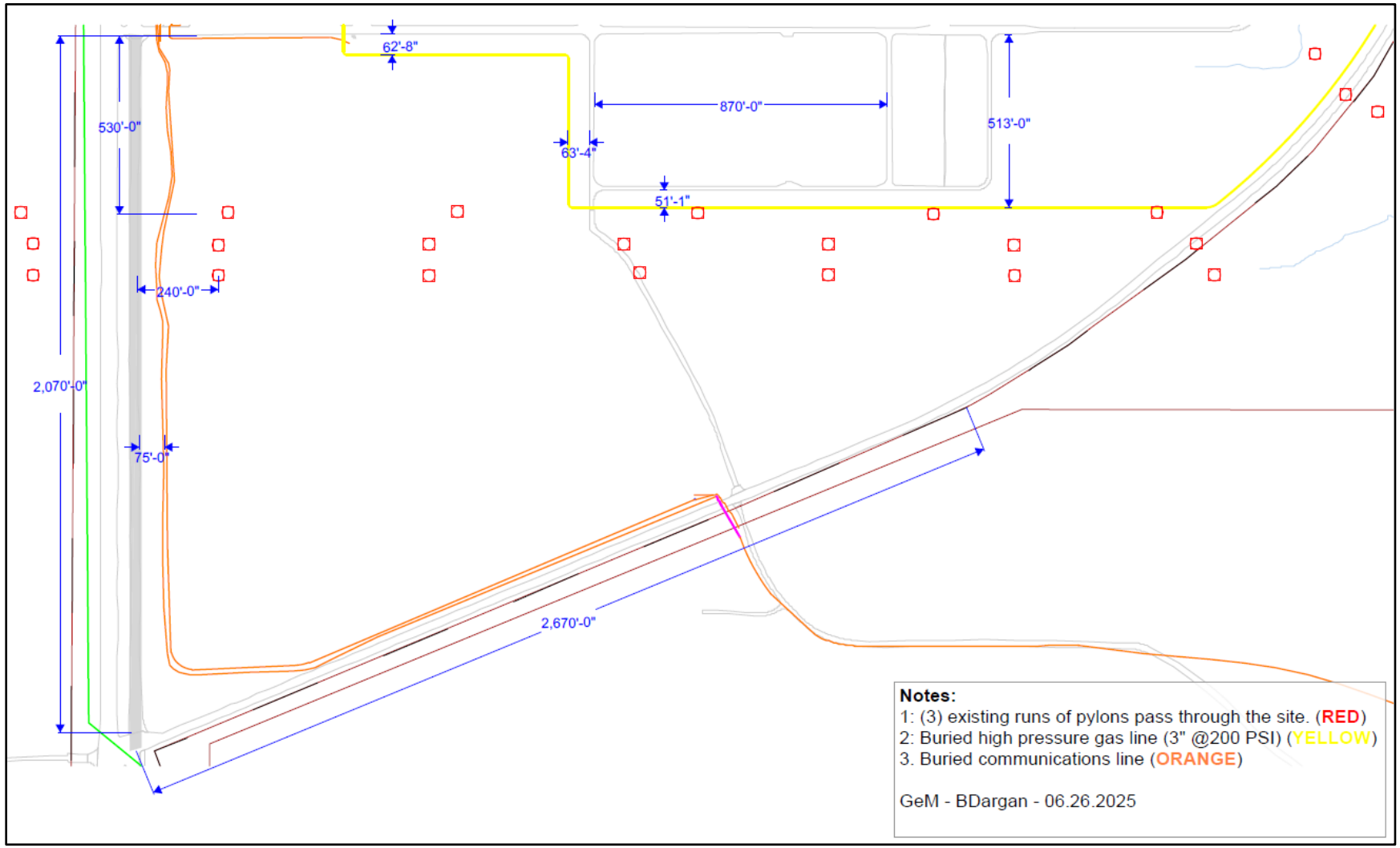


Figure A-4: General Matter Paducah Enrichment Facility Site Existing Utility Locations

A-7. Construction Activities

In the timeframe before submitting the license application in 2026 and the anticipated issuance of the license by NRC in 2027, site preparation activities have been and will be performed. The following land-disturbing activities would occur on the GMPEF Site during the pre-licensing period:

- Timber harvesting.
- Clearing and grubbing of vegetation.
- Topsoil removal and stockpiling.
- Soil improvements.
- Preparing pad for concrete.
- Grading and excavation.
- Relocation of obstructing utilities.

Pre-construction activities for facilities with no nexus to radiological safety could also occur during the pre-licensing period, as analyzed in the *Environmental Assessment for General Matter's Site Preparation and Licensing Activities in Parcel A of the Paducah Site in McCracken County, Kentucky* (DOE/EA-2327). These activities include:

- Slab on grade construction.
- Utility installation.
- Steel erection.
- Building enclosure construction and roofing.
- Building MEP systems installation.

To assess impacts in Chapter 4.0, *Environmental Impacts*, it is assumed that land-disturbing activities could impact all 107 acres of the GMPEF Site. The construction workforce is estimated to be 600 employees working one 10-hour shift per day, 6 days per week.

The GMPEF would be built on land owned by DOE and would be consistent with the site's current Heavy Industry Zone zoning classification (DOE, 2025a). A short access road to the GMPEF Site from Hobbs Road would be built. The GMPEF Site would require the clearing of approximately 70 acres of forested land; the other portions of the site (approximately 30 acres) are currently periodically mowed vegetation under the transmission line right-of-way.

The existing transmission lines that traverse the GMPEF Site would need to be relocated to the southern and eastern margins of the site to allow for complete construction of the GMPEF (see Figure A-5). Approximately 15 structures, to include 0.7 miles of transmission infrastructure and three circuits, would be moved to the southern border of the GMPEF Site. Transmission line relocation will remain within the property boundary, and therefore, additional ecological impacts would not result from this activity. Construction of the GMPEF will occur in phases with the construction of some of the facilities before relocation of the transmission lines.

New aboveground electrical utility lines will connect the GMPEF to a new electrical substation, as shown on Figure A-2. [redacted]

[redacted]

(Trade Secret / Confidential Commercial Information)

The existing DOE Paducah Site water system would provide water during construction and operations. A potable water supply line would be run from the existing water line along Hobbs Road. In the future, GeM may connect to the local utility, Paducah Water, to provide water to the facility. The GMPEF would require approximately 24.4 million gallons per year of water during construction.

Sanitary water would be discharged to the existing DOE Paducah Site sanitary wastewater system. A sanitary sewer line would be run to the existing sewer line along Hobbs Road. Utility lines would likely follow existing or proposed roadways to minimize environmental impacts.

The GMPEF will have onsite stormwater detention ponds as shown in Figure A-7.

GeM will also obtain Kentucky Pollutant Discharge Elimination System permit coverage for two additional outfalls to Bayou Creek and Little Bayou Creek (see Figure A-6). Stormwater runoff would then be conveyed to the new permitted outfalls. New outfalls will be constructed during the construction phase of the Proposed Action activities. GeM plans to submit permit applications for the new outfalls to the Kentucky Department for Environment Protection by the end of 2026.

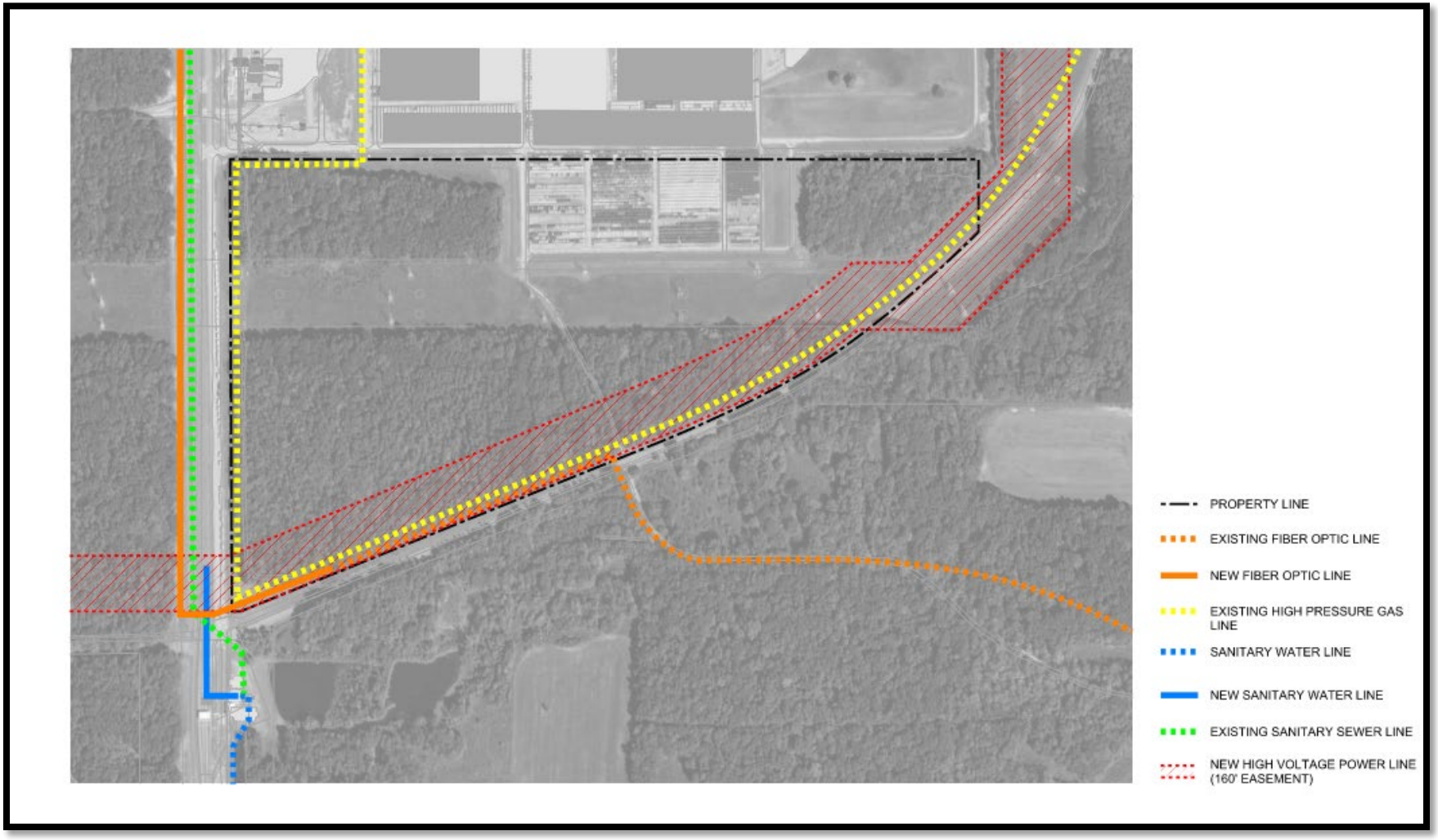


Figure A-5: General Matter Paducah Enrichment Facility Transmission Line Rerouting

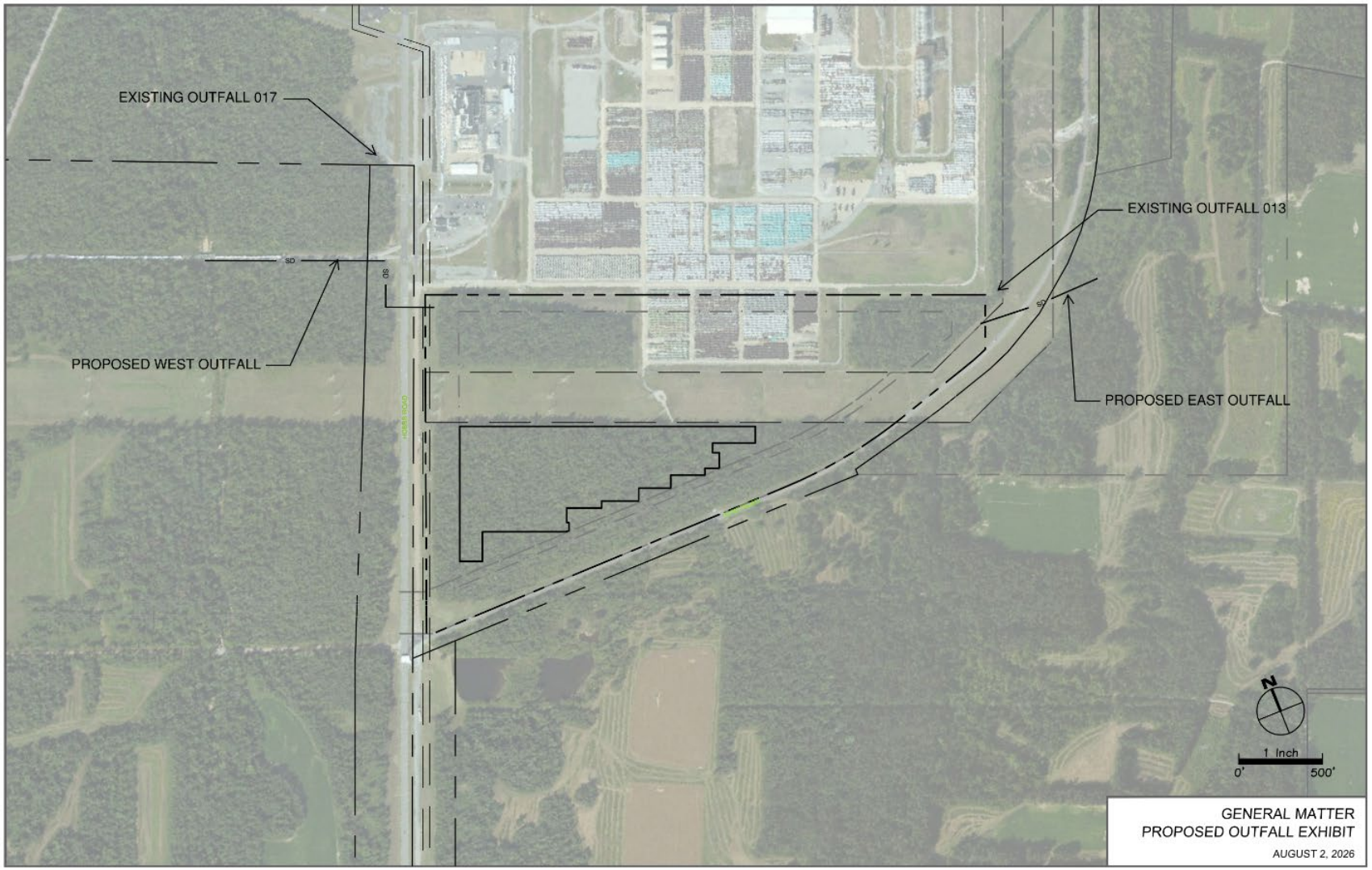


Figure A-6: Proposed Additional Outfall Locations

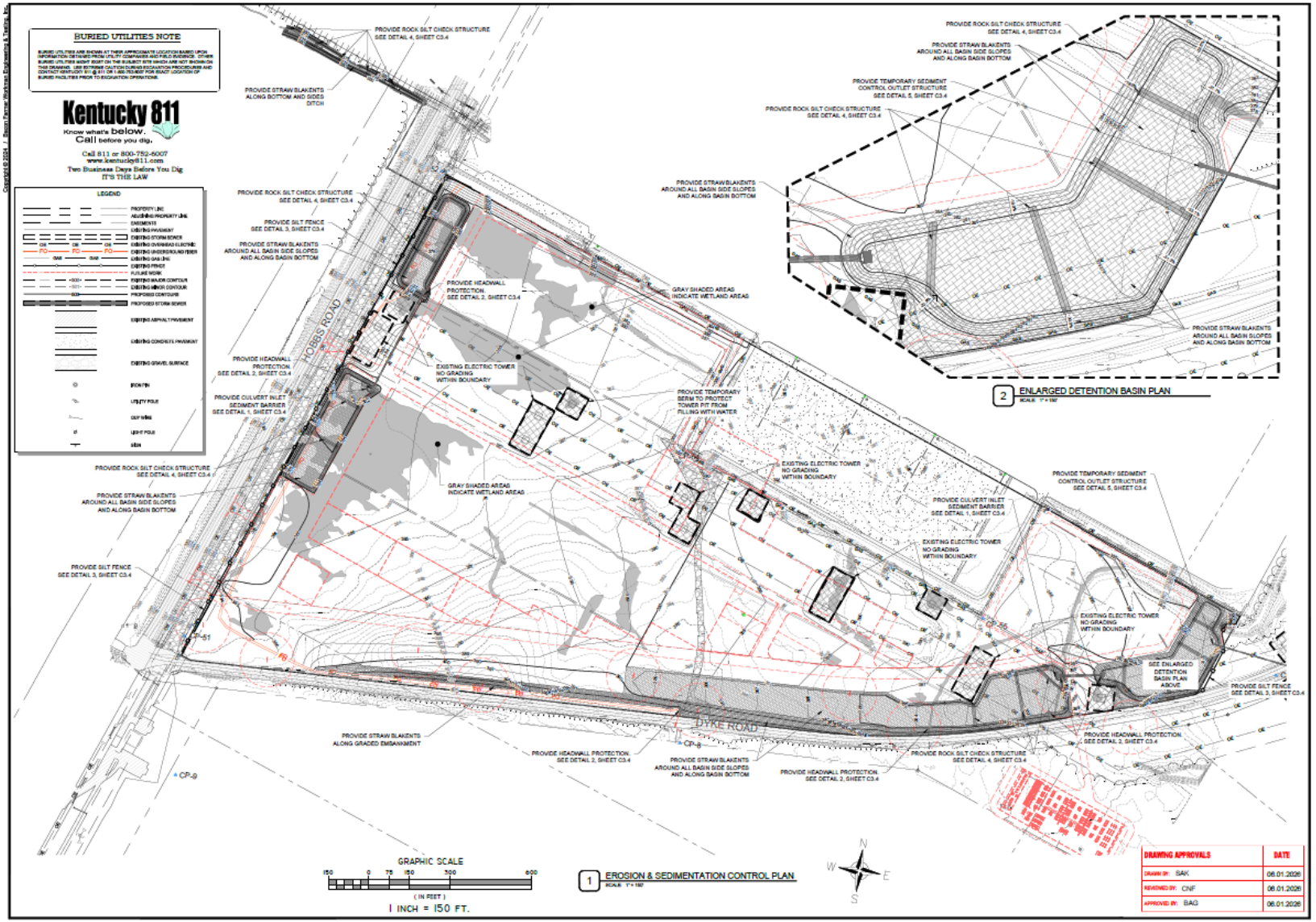


Figure A-7: Proposed Detention Basin Plan

A-8. Operational Activities

Operations at the GMPEF would involve receiving natural uranium feed materials (i.e., UF_6) from various sources (e.g., the Honeywell facility in Metropolis, Illinois; and the Cameco facility in Port Hope, Ontario, Canada) and DUF_6 from the DOE Paducah Site and/or other industrial partners. Additionally, some GMPEF uranium feed materials could be supplied from overseas sources and arrive at ports in Baltimore, Maryland, or Portsmouth, Virginia. Materials would be transported to the GMPEF Site via trucks and would arrive at the GMPEF access road along Hobbs Road via U.S. Highway 60 or along Dyke Road and Hobbs Road directly from the Paducah Site.

GeM enrichment technology would be used to separate depleted uranium feed material containing approximately 0.23 percent U-235 into a UF_6 product stream enriched to 0.71 percent U-235. The GMPEF would enrich several million Separative Work Units across both Production Hall A and Production Hall B. The UF_6 product would be used as feed material for future enrichment to LEU or HALEU.

The GMPEF would utilize industry-standard 48Y and 30B UF6 containers and processes for material handling aspects of enrichment facility operations similar to those utilized at other uranium-enrichment facilities. [redacted] (Trade Secret / Confidential Commercial Information)

Secondary tails from GMPEF operations enriching DUF_6 to natural uranium would be returned to the Paducah Site. Low-level radioactive waste generated by GMPEF operations would be shipped to the Waste Control Specialists disposal facility in Andrews County, Texas, the Energy*Solutions* disposal facility in Clive, Utah, or another commercial low-level radioactive waste disposal facility.

Key attributes of construction and operations are listed in Table A-1; waste types and quantities of the construction and operations are listed in Table A-2 and Table A-3.

Table A-1: Key Attributes of Construction and Operations

Attribute	Construction	Operation
Land Disturbed	100 acres	NA
Soil Excavated	317,000 cy	NA
Backfill Needed	376,000 cy	NA
Maximum Structure Height	Crane(s) – 300 ft	• Buildings – 71 ft • Air emission stacks – 72 ft
Lighting	Outdoor lighting would be shielded to minimize impacts to surrounding users and to comply with applicable regulations.	
Utility Connections	Portable generators, water trucks, temporary power connections, temporary water connections, mobile light plants, and portable toilets would be used.	Connections to: • Electrical lines from the DOE Paducah Site to the switchyard shown in Figure A-2. [redacted] (Trade Secret / Confidential Commercial Information) • DOE Paducah Site water supply line on Hobbs Road (or other utility as needed) • DOE Paducah Site sanitary sewer line on Hobbs Road (or other utility as needed) • DOE-owned natural gas line south of the cylinder storage yard. Atmos is the natural gas provider.
Employment	600 employees working one 10-hour shift per day, 6 days per week.	140 employees split into 4 groups of 25 to cover 3 rotating shifts and approximately 40 corporate staff working the weekday (daytime) shift.
Cylinder Storage Capacity	NA	20,000 cylinders
DUF_6 Cylinders Received from the DOE Paducah Site	NA	7,600 48” cylinders (approximately 250 per year) [a]
Filled 30B Containers (LEU)	NA	~152 per year
Filled 48” Cylinders (natural U)	NA	~242 per year
Filled 48” Cylinders (DU)	NA	~1,200 per year
Nonradiological Air Emission Sources	• Construction schedules assume 10-hour days, 6 days per week • Vehicle trips for 600 workers • 30 trucks per day for general deliveries • 10 trucks per day for [redacted] (Trade Secret / Confidential Commercial Information) • Excavator (2) • Bulldozer (4) • Loaders (4) • Dump truck (10) • Grader (4)	Operations air emission sources include: • Vehicle trips for 140 workers • 15 trucks per week for new cylinders delivery • 3 trucks per week for product delivery in 30B containers • 3 trucks per day for general delivery • Backup generators (8 MW total for backup load, approximately 10% runtime) • Primary chemical hazards are UF_6 vapors, HF, and UO_2F_2, resulting from UF_6 vapor contact with water.

Table A-1: Key Attributes of Construction and Operations

Attribute	Construction	Operation
	• Compactor (2) • Trencher (2) • Concrete Mix Trucks (8) • Concrete Pump Trucks (4) • 25-ton Crane (2) • 250-ton Crane (2) • Telehandler (6) • Forklift (20) • Scissor Lift (50) • Boom Lift (12) • Generator (1MW) (2) • Lighting Towers (12) • Water Truck (2) • Skid Steer (4) • Backhoe (4)	
Radiological Air Emission Sources	NA	The facility would have a gaseous effluent ventilation system to limit the release of airborne wastes: • Filtered with prefilter, HEGA carbon filter, and HEPA filter • Monitored for airflow, HF, and (redundant) alpha detectors • Consistent with NRC Reg Guides 4.16 and 1.140 Radioactive air emissions would not exceed emissions standard of 10 mrem per year
Noise Sources	See equipment listed under Non-Radiological Air Emission Sources.	See equipment listed under Non-Radiological Air Emission Sources. In addition, the following facility equipment could also contribute to operational noise sources: • [redacted] (Trade Secret / Confidential Commercial Information) • Cooling fans • Compressors • Pumps • Emergency generators

Table A-1: Key Attributes of Construction and Operations

Attribute	Construction	Operation
		• Alarming and annunciations (not anticipated to be a constant noise source)
Water Use	24.4 million gpy supplied by a combination of the existing DOE Paducah Site water system and potable water tanker trucks.	265 million gpy supplied by the existing DOE Paducah Site water system (C-611 Water treatment Plant). In the future, GeM may connect to the local utility, Paducah Water, to provide water.
Sanitary Wastewater Generated [b]	Portable toilets used.	10,000 gpd sent to the DOE Paducah Site sanitary sewer system to be treated at the C-615 Sewage Treatment Plant and discharged to KPDES permitted Outfall 004 which then discharges through Outfall 008. Outfall 008 effluents discharge into Big Bayou Creek.
Stormwater Management	GeM will file its own KPDES Construction Stormwater General Permit and maintain its own Stormwater Pollution Prevention Plan.	Stormwater would be conveyed to the northwest and northeast corners of the GMPEF Site and would discharge stormwater under a new KPDES permit, with outfalls discharging to Bayou Creek, and/or to Little Bayou Creek.
Waste Generated	• Municipal Solid Waste – 203 tons per year • Hazardous Waste – 26 tons (see Table A-2)	• *Solid Waste – 406,000 lbs/yr* • *Hazardous Waste – 4,000 lbs/yr* • *LLRW – 322,000 lbs/yr (see Table A-3)* • *Mixed Waste – 220 lbs/yr (see Table A-3)*
Transportation	Construction transportation estimates: • Workforce: See Employment • 30 Delivery Trucks per day for general deliveries • 10 Delivery Trucks per day for [redacted] (Trade Secret / Confidential Commercial Information) • No use of barge is anticipated.	*Operations transportation estimate:* • *Workforce: See Employment* • *5 Delivery Trucks per day for UF_6 feedstock material* • *2 Delivery Trucks per month for product delivery in 30B containers* • *3 Delivery Trucks per day for general deliveries* • *No use of rail or barge is anticipated.*

Key: ~ = approximately; % = percent; cy = cubic yard; DOE = United States Department of Energy; DU = depleted uranium; DUF_6 = depleted uranium hexafluoride; ft = feet; GeM = General Matter, Inc.; gpd = gallons per day; gpy = gallons per year; HEGA = high-efficiency gas adsorber; HEPA = high-efficiency particulate air; HF = hydrogen fluoride; KPDES = Kentucky Pollutant Discharge Elimination System; lbs/yr = pounds per year; LEU = low-enriched uranium; LLRW = low-level radioactive waste; mrem = millirem; MW = megawatt; NA = not applicable; NRC = United States Nuclear Regulatory Commission; [redacted](Trade Secret / Confidential Commercial Information); U = uranium; UF_6 = uranium hexafluoride; UO_2F_2 = uranyl fluoride

Notes:

[a] It is assumed that all these cylinders are thin-walled cylinders that could not be reused and therefore would be sent back to DOE to be disposed as LLRW.

[b] No process wastewater or cooling wastewater is expected to be generated.

Table A-2: Hazardous Waste Types and Quantities Expected during Facility Construction

Waste Type	Annual Quantity
Paints, solvents, thinners, organics	3,000 gal
Petroleum products, oils, lubricants	3,000 gal
Sulfuric acid (battery)	100 gal
Adhesives, resins, sealers, caulking	2,000 lbs
Lead (batteries)	200 lbs
Pesticides	100 gal

Source: (NRC, 2011)
Key: gal = gallons; lbs = pound

Table A-3: Radiological and Mixed Waste Types and Quantities Expected during Facility Operation

Waste Type	Annual Quantity (lbs)	Uranium Content (lbs)
Activated carbon	1,300	110
Activated alumina	9,500	9.7
Perfluoropolyether oil	4,500	22
Liquid waste treatment sludge [a]	4,600	250 [b]
Activated sodium fluoride [c]	–	–
Assorted materials (paper, clothing, etc.)	9,300	130
Ventilation filters	200,000	24
Non-metallic components	22,000	Trace [d]
Miscellaneous mixed wastes (organic compounds) [e]	220	8.8
Combustible waste	15,000	Trace [d]
Scrap metal	53,000	Trace [d]

Source: (NRC, 2011) (rounded to 2 significant figures)
Key: – = not applicable; lbs = pounds
Notes:
[a] Sludge and evaporator concentrates.
[b] Value is composed of uranium in the citric acid and degreaser tanks, precipitated aqueous solutions, uranium in precipitated laboratory/miscellaneous effluents, and uranium in sludge from the citric acid and degreaser tanks.
[c] No wastes are produced on an annual basis. Sodium fluoride traps are not expected to saturate over the life of the plant.
[d] Not detectable above naturally occurring background concentrations.
[e] Representative organic compounds consist of acetone, toluene, ethanol, and petroleum ether.

A-9. Depleted Uranium Management

DUF_6 not intended for further enrichment would be transported back to the DOE Paducah Site or a suitable depleted deconversion facility for deconversion and storage or offsite disposal. The DUF_6 management process would be as follows:

- DUF_6 will be stored at the existing DOE Paducah Site cylinder storage yards until ready for intake by the GMPEF.
- GMPEF will receive DUF_6 from the DOE Paducah Site cylinder storage yard.
- DUF_6 will be removed from the cylinders and processed for enrichment.
- DUF_6 with an assay less than or equal to 0.1 percent will be placed back in cylinders and returned to DOE for deconversion.

- As described above, the facility would have multiple cylinder storage areas for DUF_6 cylinders. The facility has sufficient storage for 20,000 cylinders.

A-10. Decontamination and Decommissioning

General Matter has prepared a D&D plan and a Decommissioning Funding Plan for the GMPEF. The D&D plan is designed in accordance with 10 *Code of Federal Regulations* (CFR) 70.38, 10 CFR 70.25, and Subpart E of 10 CFR Part 20. The facility is designed to minimize contamination to facilitate efficient decommissioning at the end of the operational life.

The Decommissioning Funding Plan is included as part of the GeM license application in accordance with 10 CFR 70.25 (*Financial Assurance and Recordkeeping for Decommissioning*). The Decommissioning Funding Plan demonstrates financial capability to support decommissioning and closure activities. In accordance with 10 CFR 70.25(f)(2), financial assurances would be provided by GeM through a company guarantee.

Before decommissioning activities begin, an updated Decommissioning Plan would be prepared and submitted to the NRC pursuant to 10 CFR 70.38 (*Expiration and Termination of Licenses and Decommissioning of Sites and Separate Buildings or Outdoor Areas*). The Decommissioning Plan would provide information concerning the GMPEF, the types of items to be decontaminated, the disposition of facilities used for radiological materials, the assumptions upon which the cost of decommissioning is derived, and an estimated schedule for decommissioning and closing the GMPEF. It is the intent of GeM to eventually decommission and close the GMPEF so as to reduce the level of radioactivity remaining in the facility to residual levels acceptable for release of the GMPEF Site for NRC license termination and unrestricted land use pursuant to meet the requirements of 10 CFR 20.1401 (*General Provisions and Scope*) and 10 CFR 20.1402 (*Radiological Criteria for Unrestricted Use*).

Prior to decommissioning, an assessment of the radiological status of the GMPEF would be made. D&D and closure activities would include the cleaning and removal of radioactive and hazardous constituent contamination that may be present on materials, equipment, and structures. Decommissioning activities will include:

- Removal of [redacted] (Trade Secret / Confidential Commercial Information) assemblies and associated process equipment,
- Decontamination or demolition of radiological structures,
- Management of low-level radioactive waste and mixed waste,
- Final status surveys,
- Environmental and radiological verification, and
- Coordination with DOE for turnover of land or supporting structures.

Further, the DOE leasing data package prepared for the property specifies the end state for the property after decommissioning (DOE, 2025a).

It is assumed that the decommissioning phase would be similar to the construction phase in many respects (e.g., assume the same workforce as the construction phase).

A-11. References

DOE. (2025a). *DOE/LX/07-2522&D2 Leasing Data Package for Leasing Parcel A, Paducah Gaseous Diffusion Plant, Paducah, Kentucky.* U.S Department of Energy.

NRC. (2011). *Environmental Impact Statement for the Proposed Eagle Rock Enrichment Facility in Bonneville County, Idaho.* Office of Federal and State Materials and Environmental Management Programs.

APPENDIX B
CONSULTATION DOCUMENTS

B.1 U.S. Department of Agriculture Natural Resources Conservation Service Consultation

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

Owensboro Service Center
3100 Alvey Park Drive W
Owensboro, KY 42303
PHONE: 270-684-9286

Jay Austin
Leidos

June 9, 2026

RE: General Matter Paducah Enrichment Facility

Mr. Austin,

Enclosed is the Farmland Protection Policy Act (FPPA) site assessment for the proposed project in McCracken County, Kentucky. The Natural Resources Conservation Service (NRCS) is mandated to provide information on the soils and/or impact to farmland according to the Farmland Protection Policy Act (P.L. 97-98) for projects that will be utilizing federal monies. Based on the information contained in your request, it was determined that the proposed project has the potential to impact Prime and/or Statewide Important Farmland.

The proposed project site has a relative LESA value of 58, as based on a scale of 0 to 100 points (see AD-1006). The percentage of farmland in McCracken County having the same or higher value is 83.56%. The percentage of McCracken County farmland to be converted as a result of the proposed action is 0.06%.

Please do not hesitate to contact me if I may be of additional assistance.

Perri Brown

Perri P. Brown
Resource Soil Scientist
Perri.Brown@usda.gov

Natural Resources Conservation Service
USDA is an equal opportunity provider, employer, and lender.

B.2 U.S. Department of Agriculture Farmland Conversion Impact Rating

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*		Date Of Land Evaluation Request **29 May 2026**			
Name of Project **General Matter Paducah Enrichment Facility**		Federal Agency Involved **Department of Energy**			
Proposed Land Use **Industrial**		County and State **McCracken County, KY**			
PART II *(To be completed by NRCS)*		Date Request Received By NRCS 5/29/2026		Person Completing Form: Perri Brown	
Does the site contain Prime, Unique, Statewide or Local Important Farmland? *(If no, the FPPA does not apply - do not complete additional parts of this form)*	YES ☑ NO ☐	Acres Irrigated 68 acres		Average Farm Size 176 acres	
Major Crop(s) Corn	Farmable Land In Govt. Jurisdiction Acres: 96.54 % 153,947 acres	Amount of Farmland As Defined in FPPA Acres: 85.44 % 136,250			
Name of Land Evaluation System Used McCracken Co. LESA	Name of State or Local Site Assessment System	Date Land Evaluation Returned by NRCS 6/9/2026			

PART III *(To be completed by Federal Agency)*	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	86.3			
B. Total Acres To Be Converted Indirectly	0			
C. Total Acres In Site	101			
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	78.90			
B. Total Acres Statewide Important or Local Important Farmland	7.40			
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted	0.06			
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value	83.56			
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points)	58			

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)*	Maximum Points	Site A	Site B	Site C	Site D
1. Area In Non-urban Use	(15)				
2. Perimeter In Non-urban Use	(10)				
3. Percent Of Site Being Farmed	(20)				
4. Protection Provided By State and Local Government	(20)				
5. Distance From Urban Built-up Area	(15)				
6. Distance To Urban Support Services	(15)				
7. Size Of Present Farm Unit Compared To Average	(10)				
8. Creation Of Non-farmable Farmland	(10)				
9. Availability Of Farm Support Services	(5)				
10. On-Farm Investments	(20)				
11. Effects Of Conversion On Farm Support Services	(10)				
12. Compatibility With Existing Agricultural Use	(10)				
TOTAL SITE ASSESSMENT POINTS	160	0	0	0	0
PART VII ***(To be completed by Federal Agency)***					
Relative Value Of Farmland *(From Part V)*	100	58	0	0	0
Total Site Assessment *(From Part VI above or local site assessment)*	160	0	0	0	0
TOTAL POINTS ***(Total of above 2 lines)***	260	58	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? YES ☐ NO ☐

Reason For Selection:

Name of Federal agency representative completing this form:	Date:

(See Instructions on reverse side) **Form AD-1006 (03-02)**

STEPS IN THE PROCESSING THE FARMLAND AND CONVERSION IMPACT RATING FORM

Step 1 - Federal agencies (or Federally funded projects) involved in proposed projects that may convert farmland, as defined in the Farmland Protection Policy Act (FPPA) to nonagricultural uses, will initially complete Parts I and III of the form. For Corridor type projects, the Federal agency shall use form NRCS-CPA-106 in place of form AD-1006. The Land Evaluation and Site Assessment (LESA) process may also be accessed by visiting the FPPA website, http://fppa.nrcs.usda.gov/lesa/.

Step 2 - Originator (Federal Agency) will send one original copy of the form together with appropriate scaled maps indicating location(s)of project site(s), to the Natural Resources Conservation Service (NRCS) local Field Office or USDA Service Center and retain a copy for their files. (NRCS has offices in most counties in the U.S. The USDA Office Information Locator may be found at http://offices.usda.gov/scripts/ndISAPI.dll/oip_public/USA_map, or the offices can usually be found in the Phone Book under U.S. Government, Department of Agriculture. A list of field offices is available from the NRCS State Conservationist and State Office in each State.)

Step 3 - NRCS will, within 10 working days after receipt of the completed form, make a determination as to whether the site(s) of the proposed project contains prime, unique, statewide or local important farmland. (When a site visit or land evaluation system design is needed, NRCS will respond within 30 working days.

Step 4 - For sites where farmland covered by the FPPA will be converted by the proposed project, NRCS will complete Parts II, IV and V of the form.

Step 5 - NRCS will return the original copy of the form to the Federal agency involved in the project, and retain a file copy for NRCS records.

Step 6 - The Federal agency involved in the proposed project will complete Parts VI and VII of the form and return the form with the final selected site to the servicing NRCS office.

Step 7 - The Federal agency providing financial or technical assistance to the proposed project will make a determination as to whether the proposed conversion is consistent with the FPPA.

INSTRUCTIONS FOR COMPLETING THE FARMLAND CONVERSION IMPACT RATING FORM

(For Federal Agency)

Part I: When completing the "County and State" questions, list all the local governments that are responsible for local land use controls where site(s) are to be evaluated.

Part III: When completing item B (Total Acres To Be Converted Indirectly), include the following:

1. Acres not being directly converted but that would no longer be capable of being farmed after the conversion, because the conversion would restrict access to them or other major change in the ability to use the land for agriculture.
2. Acres planned to receive services from an infrastructure project as indicated in the project justification (e.g. highways, utilities planned build out capacity) that will cause a direct conversion.

Part VI: Do not complete Part VI using the standard format if a State or Local site assessment is used. With local and NRCS assistance, use the local Land Evaluation and Site Assessment (LESA).

1. Assign the maximum points for each site assessment criterion as shown in § 658.5(b) of CFR. In cases of corridor-type project such as transportation, power line and flood control, criteria #5 and #6 will not apply and will, be weighted zero, however, criterion #8 will be weighed a maximum of 25 points and criterion #11 a maximum of 25 points.

2. Federal agencies may assign relative weights among the 12 site assessment criteria other than those shown on the FPPA rule after submitting individual agency FPPA policy for review and comment to NRCS. In all cases where other weights are assigned, relative adjustments must be made to maintain the maximum total points at 160. For project sites where the total points equal or exceed 160, consider alternative actions, as appropriate, that could reduce adverse impacts (e.g. Alternative Sites, Modifications or Mitigation).

Part VII: In computing the "Total Site Assessment Points" where a State or local site assessment is used and the total maximum number of points is other than 160, convert the site assessment points to a base of 160.
Example: if the Site Assessment maximum is 200 points, and the alternative Site "A" is rated 180 points:

$$\frac{\text{Total points assigned Site A}}{\text{Maximum points possible}} = \frac{180}{200} \text{ X } 160 = 144 \text{ points for Site A}$$

For assistance in completing this form or FPPA process, contact the local NRCS Field Office or USDA Service Center.

NRCS employees, consult the FPPA Manual and/or policy for additional instructions to complete the AD-1006 form.

B.3 U.S. Fish and Wildlife Service Kentucky Field Office Section 7 Concurrence Letter

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Kentucky Ecological Services Field Office
330 West Broadway, Suite 265
Frankfort, Kentucky 40601
(502) 695-0468

October 28, 2025

Jantien Shizuru
General Matter, Inc.
1 Letterman Dr., Bldg. D 5th Floor
San Francisco, CA 94129-1494 USA

Re: FWS 2025-0117162; GEM-LIC-2025-006; NRC Docket Number: 07007040, Environmental Report (ER) for the General Matter Paducah Enrichment Facility Project on the Paducah Site in McCracken County, Kentucky

Dear Jantien Shizuru:

The U.S. Fish and Wildlife Service's (Service) Kentucky Field Office (KFO) has reviewed the above referenced request for concurrence and environmental report received September 19, 2025. The KFO offers the following comments in accordance with the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*).

Project Description
On behalf of the U.S. Department of Energy (DOE), General Matter, Inc. (GeM) conducted field work and prepared an environmental report to support the licensing and construction of the proposed General Matter Paducah Enrichment Facility (GMPEF). GeM proposes to locate the GMPEF on land leased from the DOE Paducah Site (formerly the Paducah Gaseous Diffusion Plant) near Paducah, Kentucky. The action area is approximately 101-acre in size and comprises mixed-growth forests with numerous emergent and forested wetlands, ephemeral streams, ponds, and a transmission line corridor right-of-way with herbaceous vegetation and emergent wetlands. The entire GMPEF action area would be developed as part of the proposed action.

Federally Listed Species
GeM has determined that the proposed action will have "no effect" on the gray bat (*Myotis grisescens),* longsolid (*Fusconaia subrotunda*), rabbitsfoot (*Quadrula cylindrica cylindrica*), clubshell (*Pleurobema clava*), fanshell (*Cyprogenia stegaria*), fat pocketbook (*Potamilus capax*), orangefoot pimpleback (pearlymussel) (*Plethobasus cooperanmus*), pink mucket (*Lampsilis abrupta*), ring pink (*Obovaria retusa*), rough pigtoe (*Pleurobema plenum*), sheepnose mussel (*Plethobasus cyphyus*), and spectaclecase (*Cumberlandia monodonta*) due to lack of suitable habitat in the action area. There is no requirement to request concurrence with "no effect" determinations; however, the KFO acknowledges these determinations and has no additional comments or concerns regarding these species.

GeM has also determined that the proposed action has the potential to affect the federally endangered Indiana bat (*Myotis sodalis*), and the federally proposed tricolored bat (*Perimyotis subflavus*) and monarch butterfly (*Danaus plexippus*).

Indiana Bat and Tricolored Bat

CEC Inc. qualified biologists conducted presence / absence mist net surveys within the vicinity of the proposed action area between August 5-7, 2025. The surveys were conducted in accordance with the Service's "2025 Range-Wide Indiana Bat Summer Survey Guidelines." During the mist netting surveys, 15 bats were captured representing two species; however, no federally-listed or federally-proposed bat species were captured. Therefore, we believe that the Indiana bat and tricolored bat are not likely to be using habitat in the action area during the summer. In addition, biologists conducted a field survey of the action area to identify any potential caves and/or features that could be used as winter habitat. No suitable caves and/or cave-like features were identified. Based on these results, the proposed action is not anticipated to adversely affect suitable winter habitat for these species. The Service concurs that the proposed action is *not likely to adversely affect* the Indiana bat or tricolored bat.

Monarch Butterly

GeM has determined that the proposed action would not jeopardize the continued existence of the species. Based on our knowledge of the species, and the relatively small reduction in potentially suitable habitat in comparison within the species range, we acknowledge your determination that the proposed action is not likely to jeopardize the continued existence of the monarch butterfly.

Conclusion

In view of these findings, we believe that the requirements of section 7 of the Endangered Species Act have been fulfilled for this project. Your obligations under section 7 must be reconsidered, however, if: (1) new information reveals that the proposed action may affect listed species in a manner or to an extent not previously considered, (2) the proposed action is subsequently modified to include activities, which were not considered during this consultation, or (3) new species are listed, or critical habitat designated.

If you have any questions regarding the information that we have provided, please contact Phil DeGarmo at (502) 695-0468 extension 46110 or Phil_DeGarmo@fws.gov.

Sincerely,

MARK CANTRELL

Digitally signed by MARK CANTRELL
Date: 2025.10.28 13:37:00 -05'00'

For Joshua Lillpop
Acting Field Supervisor

B.4 Kentucky Biological Assessment

Andy Beshear
Governor

Energy and Environment Cabinet
Office of Kentucky Nature Preserves
300 Sower Boulevard
Frankfort, Kentucky 40601
Telephone: 502-782-7828
EEC.KYBAT@ky.gov

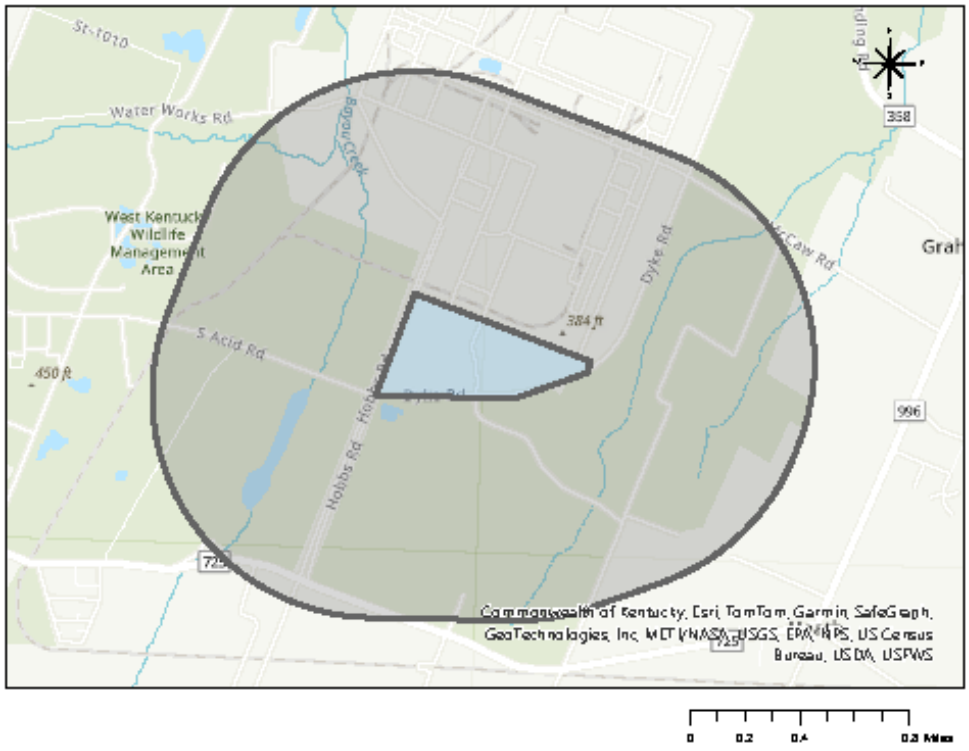
Rebecca W. Goodman
Secretary

Zack Couch
Executive Director

Requested on Friday, September 12, 2025 by Sarah B. Rauch, Leidos

Re: Kentucky Biological Assessment Data Request 20250912S01
General Matter, LLC - GMPEF
Other, 1 mile buffer.
MCCRACKEN County, Kentucky

This letter is in response to your data request for the project referenced above. We have reviewed our Natural Heritage Program Database to determine if any of the endangered, threatened, or special concern plants, animals, features, or exemplary natural communities monitored by the Office of Kentucky Nature Preserves are noted within your submitted project area.



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Andy Beshear
Governor

Energy and Environment Cabinet
Office of Kentucky Nature Preserves
300 Sower Boulevard
Frankfort, Kentucky 40601
Telephone: 502-782-7828
EEC.KYBAT@ky.gov

Rebecca W. Goodman
Secretary

Zack Couch
Executive Director

Thank you for using the Office of Kentucky Nature Preserves' Biological Assessment Tool.

This report provides site-specific biological data for the proposed project area, offering documented occurrences of rare, threatened, and endangered species. Unlike other tools which may model potential species presence, this tool delivers verified field data collected by biologists, ensuring an accurate understanding of site conditions. Some regulatory processes request this information for project siting, permitting, and conservation planning. Understanding the presence of endangered, threatened, or special concern plants, animals or exemplary natural communities may help avoid delays, mitigate risks, and support compliance with environmental guidelines.

Key Findings included in the report:

A - Occurrences which intersect the project area
B - Occurrences which intersect the buffer around the project area
C - References and Recommendations relevant to occurrences near to or within the project area

We would like to take this opportunity to remind you of the terms of the data request license, which you agreed upon in order to submit your request. Data and data products received from the Office of Kentucky Nature Preserves, including any portion thereof, may not be reproduced in any form or by any means without the express written authorization of the Office of Kentucky Nature Preserves. These products are provided on a temporary basis for the express project (described above) of the requester, and may not be redistributed, resold or copied without the written permission of the Office of Kentucky Nature Preserves.

Please note that the quantity and quality of data are dependent on the research and observations of many individuals and organizations. In most cases, this information is not the result of comprehensive or site-specific field surveys; many natural areas in Kentucky have never been thoroughly surveyed and new plants and animals are still being discovered. For these reasons, we cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of Kentucky. These reports summarize the existing information known to the Kentucky Natural Heritage Database at the time of the request. They should never be regarded as final statements on the occurrences being considered, nor should they be substituted for on-site surveys required for environmental assessments. Please note that certain sensitive occurrences may be listed in this table but are not represented in the accompanying map.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office by email at EEC.KYBAT@ky.gov.

Sincerely,

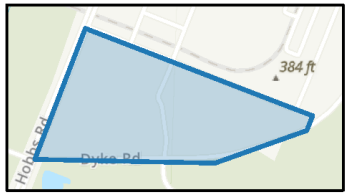
Alexis R. Sheehan
Database Administrator
Office of Kentucky Nature Preserves

Sydnie Hansen
GIS Analyst
Office of Kentucky Nature Preserves

A. Project Area - Occurrence Report

This section details occurrences that have been documented within the project footprint through direct field surveys. Presence is based on confirmed biological observations. The table below includes the species' status at state and federal levels, as well as the dates each occurrence was last observed. Please review Precision, as it is indicative of the location uncertainty of the individual records.

Botanical
Ecological
Zoological



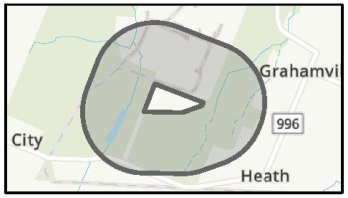
ID	Classification	Scientific Name	Common Name	Precision	Fed. Status	State Status	G Rank	S Rank	SWAP	Last Obs. Date	Habitat	Location
14297	*Vascular Plants*	*Asclepias hirtella*	**Prairie milkweed**	*Gen.*		*Threatened*	*G5*	*S2*	*Yes*	*2022-07-14*	Fields, barrens and roadsides.	West KY. WMA (Best Source). Intersection of Ogden Landing Rd and WMA Rd, approx. 0.2mi east of Boldry School Road (001B), Ogden Landing Road 0.7mi west of intersection with Metropolis Lake Rd (001C). Along Woodville Road, KY 725. On North side of road in
15952	*Breeding Birds*	*Lanius ludovicianus*	**Loggerhead Shrike**	*Quad.*		*Special Concern*	*G4*	*S3S4B,S4*	*Yes*	*1988*		CW block of quadrangle.
16692	*Vascular Plants*	*Silphium integrifolium*	**Rosinweed**	*Min.*			*G5*	*S3S4*		*1986-07-19*		From downtown Paducah, KY take KY60 west for 11 miles. Population on south side of road near intersection of KY76.

Map Credits: Commonwealth of Kentucky, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, USFWS

B. Buffer Area - Occurrence Report

This section details occurrences recorded within the project footprint, as well as the designated buffer area surrounding the project site. While these species are not directly within the project footprint, their proximity may influence project planning due to habitat connectivity or regulatory considerations.

Botanical
Ecological
Zoological

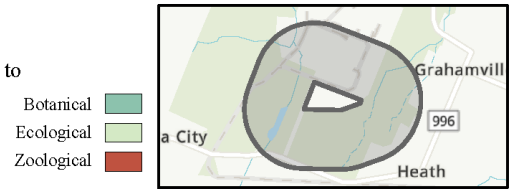


ID	Classification	Scientific Name	Common Name	Precision	Fed. Status	State Status	G Rank	S Rank	SWAP	Last Obs. Date	Habitat	Location
1398	Mammals	Myotis austroriparius	**Southeastern Myotis**	Sec.		Special Concern	G4	S3	Yes	1999-07-14		Sensitive Element - Contact OKNP at EEC.KYBAT@ky.gov
3488	Amphibians	Lithobates areolatus circulosus	**Northern Crawfish Frog**	Sec.		Special Concern	G4T4	S3		1991-03-20		Circa 0.2 air mi E of KY 1154, ca 1.2 rd mi N of its jct w/ US 60 (007A), 10.0 mi W of Paducah, nr US 60 at jct Magruder and Woodville [KY 725] roads (007B), N side KY 725, NE of jct MacGruder Rd (007C), and SW of Magruder Rd, just S of RR tracks (007D).
6935	Vascular Plants	Silphium laciniatum	**Compassplant**	Sec.		Threatened	G5	S2		2022-07-14	Prairies and barrens.	West Kentucky Wildlife Management Area, N of KY 725 between KY 726 and KY 1154 (015B); Jct of Magruder Road and Ill Gulf Central RR tracks (015A); S side of KY 725, ca 0.3 rd mi E of KY 1154 (015G); N side of KY 725, ca 0.5 rd mi (015C), ca 0.35 rd mi (01
7092	Vascular Plants	Silphium laciniatum	**Compassplant**	Sec.		Threatened	G5	S2		1993-07	Prairies and barrens.	WEST KENTUCKY WILDLIFE MANAGEMENT AREA BETWEEN SPRING BAYOU (BAYOU CREEK) AND ACID RD, CA 0.5 AIR MI NNW OF SPRING BAYOU CHURCH.
7779	Vascular Plants	Silphium laciniatum	**Compassplant**	Sec.		Threatened	G5	S2		2024-08-07	Prairies and barrens.	West Kentucky Wildlife Management Area, along both sides of unnamed gravel rd, ca 0.1 air mi S of South Acid Road (016A), old field between Bayou Creek and Acid Rd, ca 0.5 air mi N of Spring Bayou Church (016E), not specified (016B, 016C, 016D, 016F, and
9354	Vascular Plants	Baptisia leucophaea var. leucophaea	**Cream Wild Indigo**	Sec.		Threatened	G4G5T4	S2		1997-05-11	Prairies and open dry or upland woods; sandhills.	WEST KY WMA, RD AROUND NUCLEAR PLANT (DYKE RD).
12576	Amphibians	Lithobates areolatus circulosus	**Northern Crawfish Frog**	Sec.		Special Concern	G4T4	S3		2007-03-14		West KY WMA, W side of Little Bayou Creek, at SE corner of Gaseous Diffusion Plant, 1.0 air mi NW of Heath (097A). Kelley Rd, S from McCaw Lane (KY 1454) (097B). Along Kelly Rd, 326m NE of Little Bayou Creek crossing of unnamed road near Kevil (097C).
14297	Vascular Plants	Asclepias hirtella	**Prairie milkweed**	Gen.		Threatened	G5	S2	Yes	2022-07-14	Fields, barrens and roadsides.	

Map Credits: Commonwealth of Kentucky, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, USFWS

C. References and Recommendations (1 of 10)

OKNP references the following references and recommendations regarding this project's potential impacts to natural resources within or surrounding the project area. These recommendations are based on state and federal conservation guidelines and may help proactively address potential constraints. Please contact the applicable office should you have further questions with regard to these references and recommendations related to the project area.



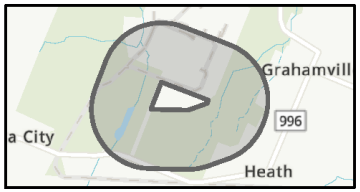
This project area overlaps with one or more wetlands recorded in the NWI. Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes. Visit https://www.fws.gov/program/national-wetlands-inventory
The proposed project area overlaps with the species range for Ambystoma talpoideum, Mole Salamander. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Siren intermedia, Lesser Siren. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Hyla avivoca, Bird-voiced Treefrog. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Podilymbus podiceps, Pied-billed Grebe. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Podiceps auritus, Horned Grebe. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Botaurus lentiginosus, American Bittern. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Ixobrychus exilis, Least Bittern. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Ardea alba, Great Egret. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Butorides virescens, Green Heron. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Nycticorax nycticorax, Black-crowned Night-heron. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Nyctanassa violacea, Yellow-crowned Night-heron. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Cygnus buccinator, Trumpeter Swan. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.

Map Credits: Commonwealth of Kentucky, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, USFWS

C. References and Recommendations (2 of 10)

OKNP references the following references and recommendations regarding this project's potential impacts to natural resources within or surrounding the project area. These recommendations are based on state and federal conservation guidelines and may help proactively address potential constraints. Please contact the applicable office should you have further questions with regard to these references and recommendations related to the project area.

Botanical
Ecological
Zoological



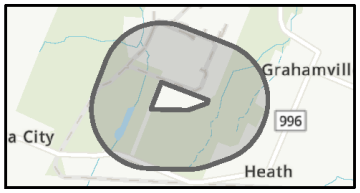
The proposed project area overlaps with the species range for Anas rubripes, American Black Duck. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Aythya marila, Greater Scaup. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Aythya affinis, Lesser Scaup. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Lophodytes cucullatus, Hooded Merganser. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Pandion haliaetus, Osprey. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Haliaeetus leucocephalus, Bald Eagle. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Circus hudsonius, Northern Harrier. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Accipiter striatus, Sharp-shinned Hawk. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Falco sparverius, American Kestrel. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Falco peregrinus, Peregrine Falcon. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Colinus virginianus, Northern Bobwhite. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Rallus limicola, Virginia Rail. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Rallus elegans, King Rail. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Porzana carolina, Sora. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Pluvialis squatarola, Black-bellied Plover. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.

Map Credits: Commonwealth of Kentucky, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, USFWS

C. References and Recommendations (3 of 10)

OKNP references the following references and recommendations regarding this project's potential impacts to natural resources within or surrounding the project area. These recommendations are based on state and federal conservation guidelines and may help proactively address potential constraints. Please contact the applicable office should you have further questions with regard to these references and recommendations related to the project area.

Botanical
Ecological
Zoological

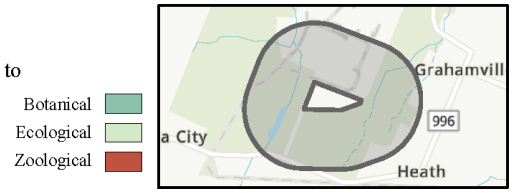


The proposed project area overlaps with the species range for Pluvialis dominica, American Golden-plover. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Charadrius melodus, Piping Plover. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Tringa flavipes, Lesser Yellowlegs. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Tringa solitaria, Solitary Sandpiper. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Actitis macularius, Spotted Sandpiper. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Bartramia longicauda, Upland Sandpiper. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Calidris alba, Sanderling. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Calidris pusilla, Semipalmated Sandpiper. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Calidris alpina, Dunlin. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Calidris himantopus, Stilt Sandpiper. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Calidris subruficollis, Buff-breasted Sandpiper. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Limnodromus griseus, Short-billed Dowitcher. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Gallinago delicata, Wilson's Snipe. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.

Map Credits: Commonwealth of Kentucky, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, USFWS

C. References and Recommendations (4 of 10)

OKNP references the following references and recommendations regarding this project's potential impacts to natural resources within or surrounding the project area. These recommendations are based on state and federal conservation guidelines and may help proactively address potential constraints. Please contact the applicable office should you have further questions with regard to these references and recommendations related to the project area.



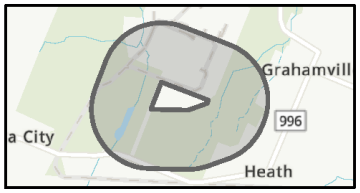
The proposed project area overlaps with the species range for Scolopax minor, American Woodcock. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Phalaropus tricolor, Wilson's Phalarope. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Sternula antillarum athalassos, Interior Least Tern. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Chlidonias niger, Black Tern. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Coccyzus americanus, Yellow-billed Cuckoo. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Tyto alba, Barn Owl. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Asio flammeus, Short-eared Owl. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Antrostomus carolinensis, Chuck-will's-widow. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Antrostomus vociferus, Whip-poor-will. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Melanerpes erythrocephalus, Red-headed Woodpecker. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Empidonax traillii, Willow Flycatcher. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Empidonax minimus, Least Flycatcher. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Riparia riparia, Bank Swallow. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Thryomanes bewickii, Bewick's Wren. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.

Map Credits: Commonwealth of Kentucky, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, USFWS

C. References and Recommendations (5 of 10)

OKNP references the following references and recommendations regarding this project's potential impacts to natural resources within or surrounding the project area. These recommendations are based on state and federal conservation guidelines and may help proactively address potential constraints. Please contact the applicable office should you have further questions with regard to these references and recommendations related to the project area.

Botanical
Ecological
Zoological



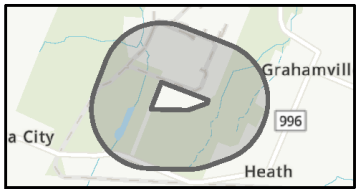
The proposed project area overlaps with the species range for Cistothorus stellaris, Sedge Wren. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Hylocichla mustelina, Wood Thrush. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Lanius ludovicianus, Loggerhead Shrike. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Vireo bellii, Bell's Vireo. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Vermivora cyanoptera, Blue-winged Warbler. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Vermivora chrysoptera, Golden-winged Warbler. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Setophaga tigrina, Cape May Warbler. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Setophaga virens, Black-throated Green Warbler. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Setophaga discolor, Prairie Warbler. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Setophaga striata, Blackpoll Warbler. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Setophaga cerulea, Cerulean Warbler. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Protonotaria citrea, Prothonotary Warbler. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Limnothlypis swainsonii, Swainson's Warbler. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.

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C. References and Recommendations (6 of 10)

OKNP references the following references and recommendations regarding this project's potential impacts to natural resources within or surrounding the project area. These recommendations are based on state and federal conservation guidelines and may help proactively address potential constraints. Please contact the applicable office should you have further questions with regard to these references and recommendations related to the project area.

Botanical
Ecological
Zoological



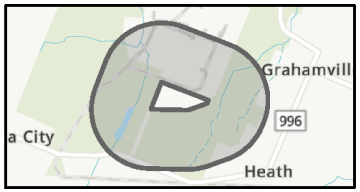
The proposed project area overlaps with the species range for Parkesia motacilla, Louisiana Waterthrush. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Geothlypis formosa, Kentucky Warbler. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Cardellina canadensis, Canada Warbler. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Spiza americana, Dickcissel. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Spizella pusilla, Field Sparrow. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Passerculus sandwichensis, Savannah Sparrow. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Ammodramus savannarum, Grasshopper Sparrow. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Centronyx henslowii, Henslow's Sparrow. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Dolichonyx oryzivorus, Bobolink. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Sturnella magna, Eastern Meadowlark. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Euphagus carolinus, Rusty Blackbird. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Ichthyomyzon castaneus, Chestnut Lamprey. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Acipenser fulvescens, Lake Sturgeon. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.

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C. References and Recommendations (7 of 10)

OKNP references the following references and recommendations regarding this project's potential impacts to natural resources within or surrounding the project area. These recommendations are based on state and federal conservation guidelines and may help proactively address potential constraints. Please contact the applicable office should you have further questions with regard to these references and recommendations related to the project area.

Botanical
Ecological
Zoological



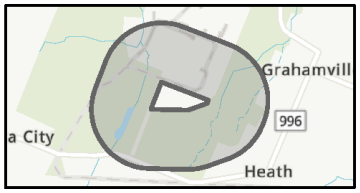
The proposed project area overlaps with the species range for Polyodon spathula, Paddlefish. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Atractosteus spatula, Alligator Gar. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Esox niger, Chain Pickerel. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Hybognathus hayi, Cypress Minnow. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Notropis maculatus, Taillight Shiner. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Cyprinella venusta, Blacktail Shiner. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Macrhybopsis hyostoma, Shoal Chub. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Erimyzon sucetta, Lake Chubsucker. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Noturus stigmosus, Northern Madtom. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Lepomis miniatus, Redspotted Sunfish. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Etheostoma proeliare, Cypress Darter. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Myotis austroriparius, Southeastern Myotis. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Myotis sodalis, Indiana Bat. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.

Map Credits: Commonwealth of Kentucky, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, USFWS

C. References and Recommendations (8 of 10)

OKNP references the following references and recommendations regarding this project's potential impacts to natural resources within or surrounding the project area. These recommendations are based on state and federal conservation guidelines and may help proactively address potential constraints. Please contact the applicable office should you have further questions with regard to these references and recommendations related to the project area.

Botanical
Ecological
Zoological



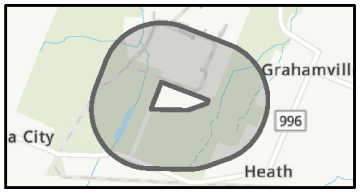
The proposed project area overlaps with the species range for Myotis septentrionalis, Northern Long-Eared Bat. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Perimyotis subflavus, Tricolored Bat. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Corynorhinus rafinesquii, Rafinesque's Big-eared Bat. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Sylvilagus aquaticus, Swamp Rabbit. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Peromyscus gossypinus, Cotton Mouse. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Farancia abacura reinwardtii, Western Mudsnake. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Agkistrodon piscivorus, Northern Cottonmouth. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Crotalus horridus, Timber Rattlesnake. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Bombus pensylvanicus, American Bumble Bee. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Euphyes dukesi, Dukes' Skipper. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Satyrium favonius ontario, Northern Oak Hairstreak. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Danaus plexippus plexippus, Monarch. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.

Map Credits: Commonwealth of Kentucky, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, USFWS

C. References and Recommendations (9 of 10)

OKNP references the following references and recommendations regarding this project's potential impacts to natural resources within or surrounding the project area. These recommendations are based on state and federal conservation guidelines and may help proactively address potential constraints. Please contact the applicable office should you have further questions with regard to these references and recommendations related to the project area.

Botanical
Ecological
Zoological



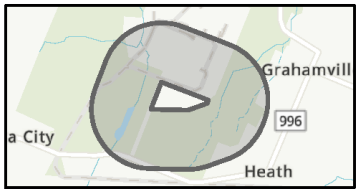
The proposed project area overlaps with the species range for Papaipema sp. 5, Rare Cane Borer Moth. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Anodontoides ferussacianus, Cylindrical Papershell. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Cumberlandia monodonta, Spectaclecase. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Ellipsaria lineolata, Butterfly. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Elliptio crassidens, Elephantear. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Lampsilis abrupta, Pink Mucket. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Lampsilis ovata, Pocketbook. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Ligumia recta, Black Sandshell. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Obovaria olivaria, Hickorynut. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Obovaria retusa, Ring Pink. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Plethobasus cooperianus, Orangefoot Pimpleback. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Plethobasus cyphyus, Sheepnose. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Pleurobema cordatum, Ohio Pigtoe. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Potamilus capax, Fat Pocketbook. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.

Map Credits: Commonwealth of Kentucky, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, USFWS

C. References and Recommendations (10 of 10)

OKNP references the following references and recommendations regarding this project's potential impacts to natural resources within or surrounding the project area. These recommendations are based on state and federal conservation guidelines and may help proactively address potential constraints. Please contact the applicable office should you have further questions with regard to these references and recommendations related to the project area.

Botanical
Ecological
Zoological



The proposed project area overlaps with the species range for Potamilus purpuratus, Bleufer. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.
The proposed project area overlaps with the species range for Theliderma cylindrica, Rabbitsfoot. This species is noted as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. Review the Action Plan at https://app.fw.ky.gov/kyswap/ for information on possible management, research and habitat restoration efforts.

Map Credits: Commonwealth of Kentucky, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, USFWS

Thank you for using the Office of Kentucky Nature Preserves Biological Assessment Tool.

OKNP's species dataset relies on continuous monitoring and surveying for species of concern throughout the state. Any records of species of concern found within this project area would greatly benefit the quality and comprehensiveness of the statewide dataset for rare, threatened and endangered species. If you would like to contribute any additional species information, please do not hesitate to contact our office by email at EEC.KYBAT@ky.gov or by phone at 502-782-7828.

Quick Key

For a full report key, visit naturepreserves.org

Global Rank (GRANK) - Estimate of species abundance on a global scale

GX	Presumed extinct
GH	Possibly extinct; Missing
G1	Extremely Rare
G2	Rare
G3	Uncommon
G4	Common
G5	Very Common
GNR	Not ranked
GU	Unrankable due to lack of information
?	Indicates Uncertainty
T #	Appended for infraspecific taxa
Q	Indicates Questionable

State Rank (SRANK) - Estimate of species abundance in Kentucky

SX	Presumed extirpated
SH	Possibly extirpated
S2	Rare
S3	Uncommon
S4	Many Occurrences
S5	Very Common
SNR	Not ranked
SU	Unrankable due to lack of information
SNA	Not Applicable
?	Indicates Uncertainty
B	Indicates breeding population
N	Indicates non-breeding population

Precision - The precision of a record

Sec.	Seconds; Can be accurately mapped within a 3-second radius (approximately 100 ft)
Min.	Minutes; Can be mapped within a 1-minute radius (approximately 1.5 miles)
Gen.	General; Only known to a place name (within about 5 miles)
Cnty.	County; Only known to the county
Quad.	Quad; Only known to the county

TEAM KENTUCKY®
ENERGY AND ENVIRONMENT CABINET
OFFICE OF KENTUCKY NATURE PRESERVES

B.5 U.S. Army Corps of Engineers Approved Jurisdictional Determination Letter

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, LOUISVILLE DISTRICT
600 DR. MARTIN LUTHER KING JR PL
LOUISVILLE, KY 40202

December 19, 2025

Regulatory Division
South Branch
ID No. LRL-2025-00707-mlk

General Matter, Inc.
ATTN: Jantien Shizuru
13397 Lakefront Drive, Suite 100
Earth City, MO 63045
jantien@generalmatter.com

Dear Jantien Shizuru:

This letter is in regard to your correspondence dated September 23, 2025, requesting an Approved Jurisdictional Determination (AJD) sent on your behalf by Civil & Environmental Consultants, Inc., for a 103-acre property located northeast of the intersection of Hobbs Road and Dyke Road, 5 miles west of the City of Paducah, McCracken County, Kentucky (Latitude: 37.1006 N and Longitude: 88.814361 W).

The site was reviewed pursuant to Section 404 of the Clean Water Act (CWA) and Section 10 of the Rivers and Harbors Act of 1899. Section 404 of the CWA requires that a Department of the Army (DA) permit be obtained for the placement or discharge of dredged and/or fill material into "waters of the United States (U.S.)," including wetlands, prior to conducting the work (33 U.S.C. 1344). Section 10 of the Rivers and Harbors Act of 1899 requires that a DA Permit be obtained for structures or work in or affecting navigable "waters of the U.S.," prior to conducting the work (33 U.S.C. 403).

Based on the information provided to this office the site contains wetlands and streams which are not considered to be "waters of the U.S." and are not regulated under Section 404 of the Clean Water Act. However, this determination does not relieve you of the responsibility to comply with applicable state law. We urge you to contact the Kentucky Division of Water, 300 Sower Boulevard, Frankfort, Kentucky 40601 to determine the applicability of state law to your project.

This letter contains an AJD for the aforementioned site. If you object to the AJD, you may request an administrative appeal under Corps regulations at 33 C.F.R. Part 331. Enclosed you will find ENG Form 6287, Notification of Administrative Appeal Options and Process and Request for Appeal. If you request to appeal the AJD, you must submit the completed form to the Lakes and Rivers Division Office at the address listed on the enclosed ENG Form 6287.

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR Part 331.5, and that it has been received by the Division Office within **60 days** of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by **February 17, 2026.** It is not necessary to submit an RFA form to the Division office if you do not object to the determination in this letter.

This jurisdictional determination is valid for a period of five years from the date of this letter unless new information warrants revision of the determination before the expiration date.

The delineation included herein has been conducted to identify the location and extent of the aquatic resource boundaries and/or the jurisdictional status of aquatic resources for purposes of the Clean Water Act for the particular site identified in this request. This delineation and/or jurisdictional determination may not be valid for the Wetland Conservation Provisions of the Food Security Act of 1985, as amended. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should discuss the applicability of a certified wetland determination with the local USDA service center prior to starting work.

If you have any questions, please contact us by writing to the District Regulatory Office at the above address, ATTN: CELRL-RDS, or contact me directly at 502-315-6709 or Meagan.l.knuckles@usace.army.mil. Any correspondence on this matter should refer to our ID Number LRL-2025-00707-mlk. A copy of this letter will be furnished to your authorized agent.

Sincerely,

Date:
2025.12.19
08:54:44 -05'00'

Meagan Knuckles
Senior Project Manager, South Branch
Regulatory Division

Enclosures

Copy Furnished:

Ms. Laura Vrabel
Civil & Environmental Consultants, Inc.
lvrabel@cecinc.com

Sarah Rauch
Leidos
sarah.e.bresnan@leidos.com

B.6 U.S. Army Corps of Engineers No Permit Required Letter

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, LOUISVILLE DISTRICT
600 DR. MARTIN LUTHER KING JR PL
LOUISVILLE, KY 40202

December 19, 2025

Regulatory Division
South Branch
ID No. LRL-2025-00707-mlk

General Matter, Inc.
ATTN: Jantien Shizuru
13397 Lakefront Drive, Suite 100
Earth City, MO 63045
jantien@generalmatter.com

Dear Jantien Shizuru:

This is in regard to your letter, dated September 23, 2025, requesting an Approved Jurisdictional Determination (AJD) and a no permit required determination, sent on your behalf by Civil & Environmental Consultants, Inc., concerning the proposed 103-acre General Matter Paducah Enrichment Facility located northeast of the intersection of Hobbs Road and Dyke Road, 5 miles west of the City of Paducah, McCracken County, Kentucky (Latitude: 37.1006 N and Longitude: 88.814361 W). We have reviewed the submitted application in accordance with the provisions of Section 404 of the Clean Water Act.

Based on the information submitted by you, it does not appear that a Department of the Army permit will be needed since the project identified by the boundary on the attached "Site Plan, A-100," dated July 12, 2025, would not involve a discharge of dredged and/or fill material below the Ordinary High Water elevation of any "waters of the United States (U.S.)" or any wetlands. "Waters of the U.S." include all waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce.

If the project would necessitate the discharge of dredged or fill material into "waters of the U.S.," including wetlands, plans should be submitted for our review.

Our comments on this project are limited to only those effects which may fall within our area of jurisdiction and thus does not obviate the need to obtain other permits from State or local agencies. Lack of comments on other environmental aspects should not be construed as either concurrence or nonconcurrence with stated environmental effects.

If we can be of any further assistance, please contact this office at the above address, ATTN: CELRL-RDS or call me at 502-315-6709. Any correspondence on this matter should refer to our ID Number LRL-2025-00707-mlk.

Sincerely,

Date: 2025.12.19
07:46:37 -05'00'

Sarah Keller
Chief, South Branch
Regulatory Division

Copy Furnished:

Ms. Laura Vrabel
Civil & Environmental Consultants, Inc.
lvrabel@cecinc.com

Ms. Sarah Rauch
Leidos
sarah.e.bresnan@leidos.com

B.7 Kentucky Energy and Environment Cabinet Correspondence

From: Lindsay, Ben E (EEC) on behalf of EEC DEP 401 Water Quality Certification
To: Rauch, Sarah B. [US-US]; EEC DEP 401 Water Quality Certification; Lindsay, Ben E (EEC)
Subject: EXTERNAL: RE: State Wetland Compliance Question
Date: Thursday, May 28, 2026 9:23:07 AM
Attachments: image001.png
image002.png

CAUTION: This email originated from outside of Leidos.
Be cautious when clicking or opening content.

Hi Sarah,

Thank you for providing this. Based upon the attached AJD and "No Permit Required" Letter, this project does not require a 401 WQC due to the lack of jurisdictional impacts. If you have any further questions or concerns, please feel free to reach out.

Best,

Ben Lindsay
Environmental Biologist I
Water Quality Certification Section
Kentucky Energy and Environment Cabinet
300 Sower Blvd, Frankfort, KY 40601
Office: 502-782-2638 ; Cell: 502-330-8424
ben.lindsay@ky.gov

TEAM KENTUCKY
ENERGY AND ENVIRONMENT CABINET

From: Rauch, Sarah B. [US-US] <SARAH.E.BRESNAN@leidos.com>
Sent: Thursday, May 28, 2026 10:06 AM
To: EEC DEP 401 Water Quality Certification <401WQC@ky.gov>; Lindsay, Ben E (EEC) <ben.lindsay@ky.gov>
Subject: RE: State Wetland Compliance Question

Hi Ben,

Thank you for the timely response. Please find the attached consultation letters from the USACE for the project and let me know if you have any questions. The proponent has received a Kentucky

Pollution Discharge Elimination System (KPDES) Stormwater Permit for construction.

Regards,

Sarah B. Rauch, CSE | Leidos
Senior Ecologist
Exploration, Energy, and Environment (E3) Division

sarah.e.bresnan@leidos.com | www.leidos.com
+1 (314) 443-9111 **M**

From: Lindsay, Ben E (EEC) <ben.lindsay@ky.gov> **On Behalf Of** EEC DEP 401 Water Quality Certification
Sent: Wednesday, May 27, 2026 12:27 PM
To: Rauch, Sarah B. [US-US] <SARAH.E.BRESNAN@leidos.com>
Cc: EEC DEP 401 Water Quality Certification <401WQC@ky.gov>
Subject: EXTERNAL: RE: State Wetland Compliance Question

Good afternoon Sarah,

Thank you for reaching out. If USACE has determined that no permit is required for this project, you will not need a 401 Water Quality Certification from our section. Can you please provide the AJD and the "No Permit Required" letter that you received from USACE?

Other permits from DOW may be required. Please contact the Floodplain Management Section (502-564-3410 or DOWFloodplain@ky.gov) if you have questions regarding the Floodplain/ Stream Construction Permit requirements. If the project will disturb one acre or more of land, or is part of a larger common plan of development or sale that will ultimately disturb one acre or more of land, a Kentucky Pollution Discharge Elimination System (KPDES) Stormwater Permit shall be required. Please contact the DOW Surface Water Permits Branch (502-564-3410 or SWPBSupport@ky.gov) for more information. If the project needs to develop a Groundwater Protection Plan (GPP), or impacts a Wellhead Protection Area (WHPA) or Sinkhole, please contact the Watershed Management Brach (502-564-3410).

Best,

Ben Lindsay
Environmental Biologist I
Water Quality Certification Section
Kentucky Energy and Environment Cabinet

300 Sower Blvd, Frankfort, KY 40601
Office: 502-782-2638 ; Cell: 502-330-8424
ben.lindsay@ky.gov

TEAM KENTUCKY
ENERGY AND ENVIRONMENT CABINET

From: Rauch, Sarah B. [US-US] <SARAH.E.BRESNAN@leidos.com>
Sent: Tuesday, May 26, 2026 4:09 PM
To: EEC DEP ENVHELP <ENVHELP@ky.gov>
Cc: EEC DEP 401 Water Quality Certification <401WQC@ky.gov>; Schuster, Jessica (EEC) <jessica.schuster@ky.gov>
Subject: Re: State Wetland Compliance Question

Much appreciated!

Sarah B. Rauch, CSE | **Leidos**
Senior Ecologist
Climate, Energy and Environment (CEE) Division

sarah.e.bresnan@leidos.com | www.leidos.com
+1 (314) 443-9111 **M**

From: EEC DEP ENVHELP <ENVHELP@ky.gov>
Sent: Tuesday, May 26, 2026 2:49:57 PM
To: Rauch, Sarah B. [US-US] <SARAH.E.BRESNAN@leidos.com>
Cc: EEC DEP 401 Water Quality Certification <401WQC@ky.gov>; Schuster, Jessica (EEC) <jessica.schuster@ky.gov>
Subject: EXTERNAL: FW: State Wetland Compliance Question

Sarah,

I've copied the 401 Water Quality Certification Team. Someone from the group will get back to you soon. If they do not, the branch can be reached at 502-564-3410.

Best,

Brittany Kring

APPENDIX C
HISTORIC CHEMICAL AND RADIOLOGICAL SAMPLE RESULTS FOR PARCEL A

C.1 Historic Chemical and Radiological Sampling Results Excerpted from Leasing Data Package for Parcel A

7. HISTORICAL DATA AND SCREENING LEVEL RISK EVALUATION

7.1. ANALYTICAL DATA SOURCES

Soil, groundwater, and sediment data were collected from locations associated with Leasing Parcel A as part of various environmental studies and investigations conducted at PGDP. Analytical data summary tables and data collection locations are provided in this section. The data reported in this section were determined to be of sufficient quality to characterize Leasing Parcel A by following the general data quality objective process provided in DOE protocols (DOE 2024b; DOE 2024c).

The source of the analytical data is a local version of the Oak Ridge Environmental Information System on the network at the Paducah Site. Data were also viewed on DOE's PPPO Environmental Geographic Analytical Spatial Information System (PEGASIS). PEGASIS allowed a visual evaluation of environmental data located in proximity to Leasing Parcel A to determine if other sample locations should be included in the data set. The analytical data are provided in Appendix C. A summary of the analysis types performed for the soil, groundwater, and sediment is provided in Table 3.

Table 3. Matrix of Analysis Types in Samples

Analysis Type	Soil	Groundwater	Sediment
Metals	X	X (uranium)	X
Radionuclides	X	X (technetium-99)	X
Semivolatile Organic Compounds (SVOCs)	X		X
PAHs	X		X
Polychlorinated biphenyls (PCBs)	X		X
VOCs	X	X	X
Wetchem	X		

The data summary process included identification and compilation of pertinent historical chemical and radiological data collected from investigations conducted within, and immediately adjacent to, the footprint of Leasing Parcel A. Analytical data collected from 2000 through 2024 are utilized for quantitative evaluation in this leasing data package. The 2000 date was chosen based on the consideration that data from 2000 to 2024 are more relevant and better represent current conditions at the Paducah Site than data collected prior to 2000. Historical data prior to 2000 were used only qualitatively for this evaluation. For example, data from older DOE investigations at the Paducah Site were reviewed qualitatively for potential impacts within Leasing Parcel A footprint and to determine chemicals or radionuclides of potential concern (COPCs). The following are specific uses of the data by medium and analytical type.

- Soil data derived since 2000 were used quantitatively.
- Groundwater, surface water, and sediment data from samples collected since 2014 were used quantitatively, if present and applicable, to focus on current conditions. Groundwater data outside the parcel boundaries were considered qualitatively. Surface water data were not available within or near Leasing Parcel A and there were two sediment data locations sampled prior to August 2000 (which are evaluated only qualitatively in the following discussion).

All data not qualified during the verification and validation process and considered usable as reported by the laboratory were included in the data set for evaluation. Data identified as estimated and qualified with a "J" (estimated concentration) were included in the data set for evaluation. Data identified as unusable (qualified

37

with an "R") were rejected and excluded from the evaluated data set. Data also were reviewed for the presence of duplicate analytical results (i.e., field duplicates or replicates). Duplicate sample results were removed from the medium-specific data set so that only unique analytical sample results were included in the evaluation process. Evaluation of duplicate analytical results was performed by comparing the duplicate sample result to the original corresponding sample result on a sample-specific and analyte-specific basis. If both the original result and the duplicate result were nondetected values, then the result with the lower detection limit (DL) was retained in the data set for that sample. If both the original and duplicate sample results were detected values, then the result with the greater detected value was retained in the data set. If either the original sample result or the duplicate sample result was a detected value and the corresponding original or duplicate sample result was a nondetected value, then the detected value was retained for evaluation.

To accurately reflect site subsurface conditions, soil data were reviewed further to exclude sample depths > 16 ft below ground surface (bgs). A depth of 16 ft bgs is considered as a reasonable depth of subsurface infrastructure at PGDP. Deeper soil data are provided in Appendix C.

7.1.1. Soil Sample Data Sources

Analytical data for soil samples from the following projects were collected within Leasing Parcel A.

- DUF_6 Conversion Facility siting
- Soil Pile investigations (DOE 2008b, DOE 2010)
- Soils OU remedial investigation (DOE 2013, DOE 2016a)
- Soils OU sitewide investigation (DOE 2015b)
- Waste Disposal Alternatives remedial investigation/feasibility study (DOE 2018)
- Characterization of soil/gravel in the C-745 cylinder storage yards

The data from these projects have been downloaded from the Paducah Site's environmental information system. The sampling locations are shown in Figure 14. The data from the C-745 cylinder storage yards consists of 20 surface soil samples collected in 1995 prior to construction of the C-745-T Cylinder Storage Yard. Due to the age of the samples and the samples only being analyzed for alpha activity, beta activity, and PCB compounds, data from these samples are only discussed qualitatively in following sections.

7.1.2. Groundwater Sample Data Sources

Historical groundwater data for Leasing Parcel A were collected as part of the Paducah Site's Environmental Monitoring Program. Samples collected from MW120 (a McNairy Formation MW) in eight sampling events between March 2020 and September 2024 yielded data for this evaluation.

7.1.3. Sediment Sample Data Sources

Historical sediment data are available from two locations, JP-0164 and UFSS-04. The sediment sampling locations are shown in Figure 14. Due to the sediment sampling being collected prior to 2014, the data are considered only qualitatively in this evaluation.

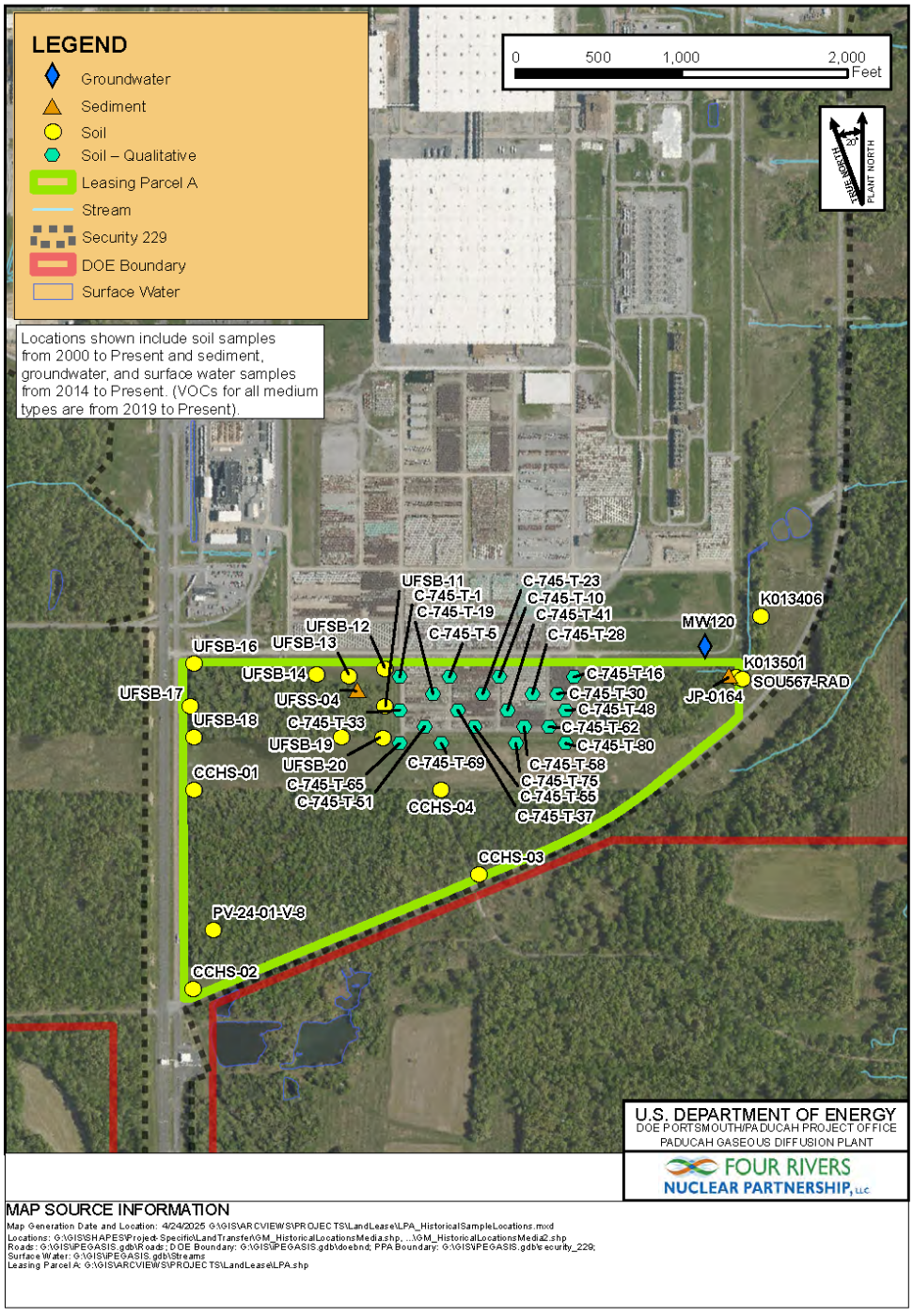


Figure 14. Historical Sample Locations by Media

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7.2. ANALYTICAL RESULTS FOR CHEMICALS

Results for chemicals found in soil, groundwater, and sediment are presented separately in the following subsections.

7.2.1. Analytical Results for Chemical Data in Soil

Analytical results of soil samples from the historical investigations are summarized in Tables 4 and 5. These summaries provide the analytes, frequency of detections (FODs), minimum and maximum detections, frequency of exceedances (FOEs), and comparisons to provisional background values and appropriate risk screening values where available. The risk screening is discussed in Section 7.4.

The following constituents were analyzed for, but were not detected in any soil samples in the data set for Leasing Parcel A. They are not considered further in evaluating site conditions.

- Antimony
- Cyanide
- Molybdenum
- Selenium
- Thallium
- Americium-243
- Cesium-134
- Cobalt-60
- Neptunium-237
- Neptunium-239
- Plutonium-238
- Plutonium-239/240
- Protactinium-234m
- 4-Nitrophenol
- Acenaphthene
- 1,2-Diphenylhydrazine
- 1,3-Dichlorobenzene
- 1,4-Dichlorobenzene
- Benzenemethanol
- Benzo(a)pyrene
- 2,4-Dichlorophenol
- 2,4-Dimethylphenol
- 2,4-Dinitrophenol
- 2,4-Dinitrotoluene
- 2,6-Dichlorophenol
- 2,6-Dinitrotoluene
- 2-Chloronaphthalene
- 2-Chlorophenol
- 2-Methyl-4,6-dinitrophenol
- 2-Methylnaphthalene
- 2-Methylphenol
- 2-Nitrobenzenamine
- 2-Nitrophenol
- 3,3'-Dichlorobenzidine
- 3-Nitrobenzenamine
- 4-Bromophenyl phenyl ether
- 4-Chloro-3-methylphenol
- 4-Chlorobenzenamine
- 4-Chlorophenyl phenyl ether
- 4-Methylphenol
- Acenaphthylene
- Anthracene
- Benz(a)anthracene
- Benzo(b)fluoranthene
- Benzo(ghi)perylene
- Benzo(k)fluoranthene
- Benzoic acid
- Bis(2-chloroethoxy)methane
- Bis(2-chloroethyl) ether
- Bis(2-chloroisopropyl) ether
- Butyl benzyl phthalate
- Carbazole
- Chrysene
- Dibenz(a,h)anthracene
- Dibenzofuran
- Diethyl phthalate
- Dimethyl phthalate
- Di-n-octylphthalate
- Fluoranthene
- Fluorene
- Hexachlorobenzene
- Hexachlorobutadiene
- Hexachlorocyclopentadiene
- Hexachloroethane
- Indeno(1,2,3-cd)pyrene
- Isophorone
- Naphthalene
- Nitrobenzene
- N-Nitrosodimethylamine
- N-Nitroso-di-n-propylamine
- N-Nitrosodiphenylamine
- Pentachlorophenol
- Phenanthrene
- Phenol
- p-Nitroaniline
- Pyrene
- Pyridine

7.2.2. Analytical Results for Chemical Data in Groundwater

A summary of the groundwater chemical data for the McNairy Formation MW, which includes comparisons to provisional backgrounds and MCLs, is provided in Table 6.

Table 4. Surface Soil Data Summary (0–1 ft bgs)

			Detected Results				Provisional Background		Industrial Worker		Industrial Worker		Outdoor Worker		Outdoor Worker		GW Protection Screen				
Type	Analysis	Unit	Min	Max	Avg	FOD	FOE	Bkgd	FOE	NAL	FOE	AL	FOE	NAL	FOE	AL	FOE	DAF 1	FOE	DAF 20	DL Range
METAL	Aluminum	mg/kg	4.47E+03	1.34E+04	8.55E+03	15/15	1/15	1.30E+04	0/15	1.00E+05	0/15	1.00E+05	0/15	3.26E+04	0/15	1.00E+05	15/15	3.00E+03	0/15	5.99E+04	20 - 199
METAL	Antimony	mg/kg	--	--	--	0/15	--	2.10E-01	--	9.34E+01	--	2.80E+03	--	1.32E+01	--	3.96E+02	--	3.52E-02	--	7.04E-01	8.06 - 20
METAL	Arsenic	mg/kg	5.01E+00	7.29E+00	5.78E+00	7/15	0/15	1.20E+01	7/15	1.60E+00	0/15	1.60E+02	7/15	7.48E-01	0/15	7.48E+01	7/15	1.51E-03	7/15	3.02E-02	4.87 - 5
METAL	Barium	mg/kg	2.73E+01	1.97E+02	8.62E+01	15/15	0/15	2.00E+02	0/15	4.04E+04	0/15	1.00E+05	0/15	6.47E+03	0/15	1.00E+05	15/15	1.55E+01	0/15	3.11E+02	2.44 - 5
METAL	Beryllium	mg/kg	5.08E-01	7.65E-01	6.08E-01	4/15	1/15	6.70E-01	0/15	4.50E+02	0/15	1.35E+04	0/15	1.97E+03	0/15	6.55E+01	0/15	1.95E+00	0/15	3.89E+01	0.487 - 0.5
METAL	Cadmium	mg/kg	2.51E+00	3.15E+00	2.80E+00	4/15	4/15	2.10E-01	0/15	6.11E+00	0/15	1.83E+02	3/15	2.54E+00	0/15	7.62E+01	4/15	1.38E-02	4/15	2.77E-01	2 - 2.48
METAL	Calcium	mg/kg	3.98E+02	1.02E+05	2.06E+04	15/15	0/15	2.00E+05	N/A	N/A	N/A	N/A	0/15	N/A	0/15	N/A	N/A	N/A	N/A	N/A	97.4 - 200
METAL	Chromium[a]	mg/kg	5.73E+00	3.39E+01	1.39E+01	15/15	3/15	1.60E+01	0/15	1.00E+05	0/15	1.00E+05	0/15	4.93E+04	0/15	1.00E+05	0/15	4.04E+06	0/15	8.09E+07	2.44 - 2.5
METAL	Chromium[b]	mg/kg	5.73E+00	3.39E+01	1.39E+01	15/15	3/15	1.60E+01	9/15	1.23E+01	0/15	1.23E+03	15/15	1.83E+00	0/15	1.83E+02	15/15	6.72E-04	15/15	1.34E-02	2.44 - 2.5
METAL	Cobalt	mg/kg	5.16E+00	8.16E+00	6.12E+00	5/6	0/6	1.40E+01	0/6	6.87E+01	0/6	2.06E+03	0/6	9.84E+00	0/6	2.95E+02	5/6	2.71E-02	5/6	5.43E-01	2.5 - 4.96
METAL	Copper	mg/kg	3.42E+00	1.07E+01	6.92E+00	13/15	0/15	1.90E+01	0/15	9.34E+03	0/15	1.00E+05	0/15	1.32E+03	0/15	3.96E+04	13/15	2.81E+00	0/15	5.62E+01	2.5 - 12.4
METAL	Iron	mg/kg	9.45E+03	1.74E+04	1.24E+04	6/6	0/6	2.80E+04	0/6	1.00E+05	0/6	1.00E+05	0/6	2.30E+04	0/6	1.00E+05	6/6	3.52E+01	6/6	7.04E+02	19.5 - 20
METAL	Lead[c]	mg/kg	1.21E+01	3.84E+01	2.40E+01	8/15	1/15	3.60E+01	0/15	8.00E+02	0/15	8.00E+02	0/15	8.00E+02	0/15	8.00E+02	6/15	1.35E+01	0/15	2.70E+02	4.87 - 20
METAL	Magnesium	mg/kg	8.05E+02	2.70E+03	1.51E+03	6/6	0/6	7.70E+03	N/A	N/A	N/A	N/A	0/6	N/A	0/6	N/A	N/A	N/A	N/A	N/A	4.87 - 15
METAL	Manganese	mg/kg	3.83E+02	1.83E+03	7.24E+02	6/6	1/6	1.50E+03	0/6	4.72E+03	0/6	1.00E+05	1/6	7.74E+02	0/6	2.32E+04	6/6	2.83E+00	6/6	5.65E+01	2.44 - 10
METAL	Mercury	mg/kg	3.00E-02	3.00E-02	3.00E-02	2/15	0/15	2.00E-01	0/15	7.01E+01	0/15	2.10E+03	0/15	9.86E+00	0/15	2.96E+02	2/15	2.95E-02	0/15	5.91E-01	0.016 - 0.2
METAL	Molybdenum	mg/kg	--	--	--	0/2	N/A	N/A	--	1.17E+03	--	3.51E+04	--	1.64E+02	--	4.92E+03	--	2.02E-01	--	4.03E+00	4.87 - 4.96
METAL	Nickel	mg/kg	6.05E+00	1.31E+01	9.27E+00	15/15	0/15	2.10E+01	0/15	2.99E+03	0/15	8.98E+04	0/15	6.21E+02	0/15	1.86E+04	15/15	2.56E+00	0/15	5.12E+01	4.87 - 5
METAL	Potassium	mg/kg	4.29E+02	6.04E+02	5.09E+02	4/4	0/4	1.30E+03	N/A	N/A	N/A	N/A	0/4	N/A	0/4	N/A	N/A	N/A	N/A	N/A	200 - 200
METAL	Selenium	mg/kg	--	--	--	0/15	--	8.00E-01	--	1.17E+03	--	3.51E+04	--	1.64E+02	--	4.92E+03	--	5.19E-02	--	1.04E+00	1 - 4.96
METAL	Silver	mg/kg	4.00E+00	4.00E+00	4.00E+00	1/15	1/15	2.30E+00	0/15	1.17E+03	0/15	3.51E+04	0/15	1.64E+02	0/15	4.92E+03	1/15	7.99E-02	1/15	1.60E+00	2.01 - 4
METAL	Sodium	mg/kg	3.43E+02	3.43E+02	3.43E+02	1/6	1/6	3.20E+02	N/A	N/A	N/A	N/A	0/6	N/A	0/6	N/A	N/A	N/A	N/A	N/A	195 - 200
METAL	Thallium	mg/kg	--	--	--	0/15	--	2.10E-01	--	2.34E+00	--	7.02E+01	--	3.29E-01	--	9.87E+00	--	1.42E-03	--	2.84E-02	9.74 - 20
METAL	Uranium[d]	mg/kg	--	--	--	0/6	--	4.90E+00	--	7.00E+02	--	2.04E+04	--	9.86E+01	--	2.95E+03	--	2.70E+00	--	5.39E+01	4.87 - 200
METAL	Uranium[e]	mg/kg	--	--	--	0/6	--	4.90E+00	--	4.66E+01	--	1.40E+03	--	6.58E+00	--	1.97E+02	--	1.80E-01	--	3.60E+00	4.87 - 200
METAL	Vanadium	mg/kg	1.64E+01	3.49E+01	2.31E+01	15/15	0/15	3.80E+01	0/15	1.15E+03	0/15	3.45E+04	0/15	1.65E+02	0/15	4.95E+03	15/15	8.64E+00	0/15	1.73E+02	2.44 - 2.5
METAL	Zinc	mg/kg	2.76E+01	5.73E+01	3.62E+01	15/15	0/15	6.50E+01	0/15	7.01E+04	0/15	1.00E+05	0/15	9.86E+03	0/15	1.00E+05	4/15	3.73E+01	0/15	7.46E+02	19.5 - 20
PPCB	Total PCBs[f]	mg/kg	--	--	--	0/15	N/A	N/A	--	2.93E-01	--	2.93E+01	--	2.24E-01	--	2.24E+01	--	6.82E-03	--	1.36E-01	0.1 - 0.13
RADS	Americium-241	pCi/g	--	--	--	0/16	N/A	N/A	--	3.99E-01	--	3.99E+01	--	3.38E-01	--	3.38E+01	--	1.29E-01	--	2.57E+00	0.0156 - 0.377
RADS	Americium-243	pCi/g	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0492 - 0.159
RADS	Cesium-134	pCi/g	--	--	--	0/13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0199 - 0.0608
RADS	Cesium-137	pCi/g	5.56E-02	2.61E-01	1.38E-01	15/16	0/16	4.90E-01	0/16	3.44E-01	0/16	3.44E+01	0/16	4.52E-01	0/16	4.52E+01	0/16	4.79E-01	0/16	9.58E+00	0.0239 - 0.099
RADS	Cobalt-60	pCi/g	--	--	--	0/13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0203 - 0.0911
RADS	Neptunium-237	pCi/g	--	--	--	0/16	--	1.00E-01	--	4.09E-01	--	4.09E+01	--	3.66E-01	--	3.66E+01	--	5.50E-03	--	1.10E-01	0.024 - 0.871
RADS	Neptunium-239	pCi/g	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.237 - 1.5
RADS	Plutonium-238	pCi/g	--	--	--	0/16	--	7.30E-02	--	9.63E-02	--	9.63E+00	--	7.81E-02	--	7.81E+00	--	8.58E-03	--	1.72E-01	0.0094 - 0.235
RADS	Plutonium-239/240[g]	pCi/g	--	--	--	0/16	--	2.50E-02	--	3.44E-01	--	3.44E+01	--	2.87E-01	--	2.87E+01	--	3.32E-02	--	6.64E-01	0.0131 - 0.0874
RADS	Potassium-40	pCi/g	1.52E+00	1.19E+01	8.26E+00	9/9	0/9	1.60E+01	N/A	N/A	N/A	N/A	0/9	N/A	0/9	N/A	N/A	N/A	N/A	N/A	0.232 - 0.804
RADS	Protactinium-234m	pCi/g	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.26 - 10.7
RADS	Radium-226	pCi/g	--	--	--	0/9	--	1.50E+00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.2 - 0.414
RADS	Technetium-99	pCi/g	5.71E-01	5.71E-01	5.71E-01	1/16	0/16	2.50E+00	0/16	1.95E+03	0/16	1.95E+05	0/16	3.32E+02	0/16	3.32E+04	1/16	7.60E-03	1/16	1.52E-01	0.41 - 3.12
RADS	Thorium-228	pCi/g	1.01E-01	8.80E-01	4.03E-01	16/16	0/16	1.60E+00	N/A	N/A	N/A	N/A	0/16	N/A	0/16	N/A	N/A	N/A	N/A	N/A	0.02 - 0.0952
RADS	Thorium-230	pCi/g	2.51E-01	1.00E+00	4.29E-01	16/16	0/16	1.40E+00	16/16	9.69E-02	0/16	9.69E+00	16/16	8.04E-02	0/16	8.04E+00	16/16	5.31E-02	0/16	1.06E+00	0.016 - 0.138
RADS	Thorium-232	pCi/g	9.40E-02	9.50E-01	4.10E-01	16/16	0/16	1.50E+00	16/16	7.52E-02	0/16	7.52E+00	16/16	8.57E-02	0/16	8.57E+00	15/16	1.16E-01	0/16	2.32E+00	0.01 - 0.064
RADS	Uranium-234	pCi/g	2.23E-01	8.10E-01	4.88E-01	3/9	0/9	1.20E+00	3/9	9.67E-02	0/9	9.67E+00	3/9	7.97E-02	0/9	7.97E+00	3/9	1.09E-03	1/9	2.17E-02	0.02 - 0.961
RADS	Uranium-235/236[h]	pCi/g	6.70E-02	6.70E-02	6.70E-02	1/1	1/1	6.00E-02	0/1	3.49E-01	0/1	3.49E+01	0/1	3.11E-01	0/1	3.11E+01	0/1	4.78E-03	0/1	9.57E-02	0.021 - 0.021
RADS	Uranium-238	pCi/g	2.64E-01	1.57E+00	1.04E+00	5/9	3/9	1.20E+00	5/9	9.53E-02	0/9	9.53E+00	5/9	7.83E-02	0/9	7.83E+00	5/9	1.06E-03	5/9	2.12E-02	0.009 - 1.15
SVOA	1,2,4-Trichlorobenzene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	1,2-Dichlorobenzene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	1,2-Diphenylhydrazine	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	1,3-Dichlorobenzene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	1,4-Dichlorobenzene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2,4,5-Trichlorophenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2,4,6-Trichlorophenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2,4-Dichlorophenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2,4-Dimethylphenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2,4-Dinitrophenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2,4-Dinitrotoluene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2,6-Dichlorophenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2,6-Dinitrotoluene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2-Chloronaphthalene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49

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Table 4. Surface Soil Data Summary (0–1 ft bgs) (Continued)

			Detected Results				Provisional Background		Industrial Worker		Industrial Worker		Outdoor Worker		Outdoor Worker		GW Protection Screen				
Type	Analysis	Unit	Min	Max	Avg	FOD	FOE	Bkgd	FOE	NAL	FOE	AL	FOE	NAL	FOE	AL	FOE	DAF 1	FOE	DAF 20	DL Range
SVOA	2-Chlorophenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2-Methyl-4,6-dinitrophenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2-Methylnaphthalene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2-Methylphenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2-Nitrobenzenamine	mg/kg	--	--	--	0/9	N/A	N/A	--	2.87E+02	--	8.61E+03	--	1.89E+02	--	5.67E+03	--	8.01E-03	--	1.60E-01	0.44 - 0.49
SVOA	2-Nitrophenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	3,3'-Dichlorobenzidine	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	3-Nitrobenzenamine	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	4-Bromophenyl phenyl ether	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	4-Chloro-3-methylphenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	4-Chlorobenzenamine	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	4-Chlorophenyl phenyl ether	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	4-Methylphenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	4-Nitrophenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Acenaphthene	mg/kg	--	--	--	0/11	N/A	N/A	--	1.38E+03	--	4.14E+04	--	1.01E+03	--	3.03E+04	--	5.49E-01	--	1.10E+01	0.44 - 0.5
SVOA	Acenaphthylene	mg/kg	--	--	--	0/11	N/A	N/A	--	1.38E+03	--	4.14E+04	--	1.01E+03	--	3.03E+04	--	5.49E-01	--	1.10E+01	0.44 - 0.5
SVOA	Anthracene	mg/kg	--	--	--	0/11	N/A	N/A	--	6.89E+03	--	1.00E+05	--	5.05E+03	--	1.00E+05	--	5.81E+00	--	1.16E+02	0.44 - 0.5
SVOA	Benzenemethanol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Benzo(ghi)perylene	mg/kg	--	--	--	0/11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.5
SVOA	Benzoic acid	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Bis(2-chloroethoxy)methane	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Bis(2-chloroethyl) ether	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Bis(2-chloroisopropyl) ether	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Bis(2-ethylhexyl)phthalate	mg/kg	6.50E-01	6.50E-01	6.50E-01	1/9	N/A	N/A	0/9	5.80E+01	0/9	5.80E+03	0/9	3.79E+01	0/9	3.79E+03	0/9	1.33E+00	0/9	2.66E+01	0.44 - 0.49
SVOA	Butyl benzyl phthalate	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Carbazole	mg/kg	--	--	--	0/9	N/A	N/A	--	9.19E+02	--	2.76E+04	--	6.73E+02	--	2.02E+04	--	5.45E-01	--	1.09E+01	0.44 - 0.49
SVOA	Di-n-butyl phthalate	mg/kg	9.50E-01	3.40E+01	6.73E+00	6/9	N/A	N/A	N/A	N/A	N/A	N/A	0/9	N/A	0/9	N/A	N/A	N/A	N/A	N/A	0.44 - 4.8
SVOA	Di-n-octylphthalate	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Dibenzofuran	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Diethyl phthalate	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Dimethyl phthalate	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Fluoranthene	mg/kg	--	--	--	0/11	N/A	N/A	--	9.19E+02	--	2.76E+04	--	6.73E+02	--	2.02E+04	--	8.91E+00	--	1.78E+02	0.44 - 0.5
SVOA	Fluorene	mg/kg	--	--	--	0/11	N/A	N/A	--	9.19E+02	--	2.76E+04	--	6.73E+02	--	2.02E+04	--	5.45E-01	--	1.09E+01	0.44 - 0.5
SVOA	Hexachlorobenzene	mg/kg	--	--	--	0/9	N/A	N/A	--	1.26E+00	--	7.01E+01	--	3.29E-01	--	9.86E+00	--	1.23E-04	--	2.46E-03	0.44 - 0.49
SVOA	Hexachlorobutadiene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Hexachlorocyclopentadiene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Hexachloroethane	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Isophorone	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	N-Nitroso-di-n-propylamine	mg/kg	--	--	--	0/9	N/A	N/A	--	1.16E-01	--	1.16E+01	--	7.58E-02	--	7.58E+00	--	8.10E-06	--	1.62E-04	0.44 - 0.49
SVOA	N-Nitrosodimethylamine	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	N-Nitrosodiphenylamine	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Naphthalene	mg/kg	--	--	--	0/11	N/A	N/A	--	4.06E+00	--	4.06E+02	--	3.34E+00	--	3.34E+02	--	3.85E-04	--	7.70E-03	0.44 - 0.5
SVOA	Nitrobenzene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Pentachlorophenol	mg/kg	--	--	--	0/9	N/A	N/A	--	8.77E-01	--	8.77E+01	--	8.11E-01	--	8.11E+01	--	5.71E-05	--	1.14E-03	0.44 - 0.49
SVOA	Phenanthrene	mg/kg	--	--	--	0/11	N/A	N/A	--	6.89E+02	--	2.07E+04	--	5.05E+02	--	1.52E+04	--	1.32E+00	--	2.63E+01	0.44 - 0.5
SVOA	Phenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Pyrene	mg/kg	--	--	--	0/11	N/A	N/A	--	6.89E+02	--	2.07E+04	--	5.05E+02	--	1.52E+04	--	1.32E+00	--	2.63E+01	0.44 - 0.5
SVOA	Pyridine	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Total PAHs[f]	mg/kg	--	--	--	0/10	N/A	N/A	--	6.43E-01	--	6.43E+01	--	4.71E-01	--	4.71E+01	--	2.94E-02	--	5.89E-01	0 - 0
SVOA	p-Nitroaniline	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
WETCHEM	Cyanide	mg/kg	--	--	--	0/4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1 - 1

One or more samples exceed AL value

One or more samples exceed NAL value

One or more samples exceed background value

One or more samples exceed groundwater protection screening

Notes:

-- = No calculation completed, analyte not detected

[a] Chromium (III) values are shown for information purposes

[b] Chromium uses NAL/AL for Chromium (VI)

[c] Lead uses DAF screening values based on the MCL

[d] Uranium (Insoluble Compounds) values are shown for information purposes

[e] Uranium uses NAL/AL for Uranium (Soluble Salts)

Table 4. Surface Soil Data Summary (0–1 ft bgs) (Continued)

Type	Analysis	Unit	Detected Results			FOD	Provisional Background		Industrial Worker		Industrial Worker		Outdoor Worker		Outdoor Worker		GW Protection Screen				DL Range
			Min	Max	Avg		FOE	Bkgd	FOE	NAL	FOE	AL	FOE	NAL	FOE	AL	FOE	DAF 1	FOE	DAF 20	
[a] Total PCBs calculated by laboratory																					
[c] Plutonium-239/240 screened against Plutonium-240 values																					
[d] Uranium-233/234 uses NALs/ALS for Uranium-235																					
[e] Total PAHs calculated using toxicity equivalence factor values in Human Health RMD (DOE 2024b)																					

Table 5. Subsurface Soil Data Summary (1–16 ft bgs)

			Detected Results				Provisional Background		Excavation Worker		Excavation Worker		Outdoor Worker		Outdoor Worker		GW Protection Screen				
Type	Analysis	Unit	Min	Max	Avg	FOD	FOE	Bkgd	FOE	NAL	FOE	AL	FOE	NAL	FOE	AL	FOE	DAF 1	FOE	DAF 20	DL Range
METAL	Aluminum	mg/kg	5.86E+03	1.43E+04	1.00E+04	28/28	4/28	1.20E+04	0/28	3.26E+04	0/28	1.00E+05	0/28	3.26E+04	0/28	1.00E+05	28/28	3.00E+03	0/28	5.99E+04	19.6 - 177
METAL	Antimony	mg/kg	--	--	--	0/28	--	2.10E-01	--	1.32E+01	--	3.96E+02	--	1.32E+01	--	3.96E+02	--	3.52E-02	--	7.04E-01	7.71 - 20
METAL	Arsenic	mg/kg	5.28E+00	1.36E+01	7.42E+00	9/28	3/28	7.90E+00	9/28	3.74E+00	0/28	3.60E+02	9/28	7.48E-01	0/28	7.48E+01	9/28	1.51E-03	9/28	3.02E-02	4.42 - 5
METAL	Barium	mg/kg	3.55E+01	1.70E+03	1.78E+02	28/28	2/28	1.70E+02	0/28	6.47E+03	0/28	1.00E+05	0/28	6.47E+03	0/28	1.00E+05	28/28	1.55E+01	2/28	3.11E+02	2.21 - 5
METAL	Beryllium	mg/kg	4.68E-01	6.60E-01	5.82E-01	7/28	0/28	6.90E-01	0/28	6.55E+01	0/28	1.97E+03	0/28	6.55E+01	0/28	1.97E+03	0/28	1.95E+00	0/28	3.89E+01	0.442 - 0.5
METAL	Cadmium	mg/kg	--	--	--	0/28	--	2.10E-01	--	2.54E+00	--	7.62E+01	--	2.54E+00	--	7.62E+01	--	1.38E-02	--	2.77E-01	2 - 2.45
METAL	Calcium	mg/kg	4.27E+02	3.78E+04	2.69E+03	28/28	1/28	6.10E+03	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	88.3 - 100
METAL	Chromium[a]	mg/kg	8.60E+00	3.24E+01	1.63E+01	28/28	0/28	4.30E+01	0/28	9.86E+01	0/28	1.00E+05	0/28	4.93E+04	0/28	1.00E+05	0/28	4.04E+06	0/28	8.09E+07	2.21 - 2.5
METAL	Chromium[b]	mg/kg	8.60E+00	3.24E+01	1.63E+01	28/28	0/28	4.30E+01	27/28	9.14E+00	0/28	9.14E+02	28/28	1.83E+00	0/28	1.83E+02	28/28	6.72E-04	28/28	1.34E-02	2.21 - 2.5
METAL	Cobalt	mg/kg	7.10E+00	1.13E+01	9.20E+00	2/2	0/2	1.30E+01	1/2	9.84E+00	0/2	2.95E+02	1/2	9.84E+00	0/2	2.95E+02	2/2	2.71E-02	2/2	5.43E-01	4.42 - 4.9
METAL	Copper	mg/kg	3.77E+00	1.37E+01	8.03E+00	26/28	0/28	2.50E+01	0/28	1.32E+03	0/28	3.96E+04	0/28	1.32E+03	0/28	3.96E+04	26/28	2.81E+00	0/28	5.62E+01	2.5 - 12.3
METAL	Iron	mg/kg	1.37E+04	1.80E+04	1.59E+04	2/2	0/2	2.80E+04	0/2	2.30E+04	0/2	1.00E+05	0/2	2.30E+04	0/2	1.00E+05	2/2	3.52E+01	2/2	7.04E+02	17.7 - 19.6
METAL	Lead[c]	mg/kg	1.63E+01	3.22E+01	2.14E+01	5/28	1/28	2.30E+01	0/28	8.00E+02	0/28	8.00E+02	0/28	8.00E+02	0/28	8.00E+02	5/28	1.35E+01	0/28	2.70E+02	4.42 - 20
METAL	Magnesium	mg/kg	8.38E+02	1.18E+03	1.01E+03	2/2	0/2	2.10E+03	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.42 - 4.9
METAL	Manganese	mg/kg	7.28E+02	7.39E+02	7.34E+02	2/2	0/2	8.20E+02	0/2	7.74E+02	0/2	2.32E+04	0/2	7.74E+02	0/2	2.32E+04	2/2	2.83E+00	2/2	5.65E+01	2.21 - 2.45
METAL	Mercury	mg/kg	2.70E-02	2.70E-02	2.70E-02	2/28	0/28	1.30E-01	0/28	9.86E+00	0/28	2.96E+02	0/28	9.86E+00	0/28	2.96E+02	0/28	2.95E-02	0/28	5.91E-01	0.015 - 0.2
METAL	Molybdenum	mg/kg	--	--	--	0/2	N/A	N/A	--	1.64E+02	--	4.92E+03	--	1.64E+02	--	4.92E+03	--	2.02E-01	--	4.03E+00	4.42 - 4.9
METAL	Nickel	mg/kg	6.00E+00	2.04E+01	1.10E+01	27/28	0/28	2.20E+01	0/28	6.21E+02	0/28	1.86E+04	0/28	6.21E+02	0/28	1.86E+04	27/28	2.56E+00	0/28	5.12E+01	4.42 - 5
METAL	Selenium	mg/kg	--	--	--	0/28	--	7.00E-01	--	1.64E+02	--	4.92E+03	--	1.64E+02	--	4.92E+03	--	5.19E-02	--	1.04E+00	1 - 4.9
METAL	Silver	mg/kg	--	--	--	0/28	--	2.70E+00	--	1.64E+02	--	4.92E+03	--	1.64E+02	--	4.92E+03	--	7.99E-02	--	1.60E+00	1.93 - 4
METAL	Sodium	mg/kg	--	--	--	0/2	--	3.40E+02	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	177 - 196
METAL	Thallium	mg/kg	--	--	--	0/28	--	3.40E-01	--	3.29E-01	--	9.87E+00	--	3.29E-01	--	9.87E+00	--	1.42E-03	--	2.84E-02	8.83 - 20
METAL	Uranium[d]	mg/kg	--	--	--	0/2	--	4.60E+00	--	9.86E+01	--	2.95E+03	--	9.86E+01	--	2.95E+03	--	2.70E+00	--	5.39E+01	4.42 - 4.9
METAL	Uranium[e]	mg/kg	--	--	--	0/2	--	4.60E+00	--	6.58E+00	--	1.97E+02	--	6.58E+00	--	1.97E+02	--	1.80E-01	--	3.60E+00	4.42 - 4.9
METAL	Vanadium	mg/kg	8.70E+00	3.24E+01	2.32E+01	28/28	0/28	3.70E+01	0/28	1.65E+02	0/28	4.95E+03	0/28	1.65E+02	0/28	4.95E+03	28/28	8.64E+00	0/28	1.73E+02	2.21 - 2.5
METAL	Zinc	mg/kg	2.36E+01	6.05E+01	3.57E+01	24/28	1/28	6.00E+01	0/28	9.86E+03	0/28	1.00E+05	0/28	9.86E+03	0/28	1.00E+05	7/28	3.73E+01	0/28	7.46E+02	17.7 - 20
PPCB	Polychlorinated biphenyl[f]	mg/kg	1.00E-01	3.00E-01	2.00E-01	3/28	N/A	N/A	0/28	1.12E+00	0/28	1.12E+02	1/28	2.24E-01	0/28	2.24E+01	3/28	6.82E-03	2/28	1.36E-01	0.1 - 0.13
RADS	Americium-241	pCi/g	1.41E-01	1.41E-01	1.41E-01	1/29	N/A	N/A	0/29	1.69E+00	0/29	1.69E+02	0/29	3.38E-01	0/29	3.38E+01	1/29	1.29E-01	0/29	2.57E+00	0.0155 - 0.365
RADS	Americium-243	pCi/g	--	--	--	0/27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0615 - 0.164
RADS	Cesium-134	pCi/g	--	--	--	0/27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0302 - 0.421
RADS	Cesium-137	pCi/g	6.51E-02	1.65E-01	1.08E-01	3/29	0/29	2.80E-01	0/29	2.26E+00	0/29	2.26E+02	0/29	4.52E-01	0/29	4.52E+01	0/29	4.79E-01	0/29	9.58E+00	0.000000662 - 0.0784
RADS	Cobalt-60	pCi/g	--	--	--	0/27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0322 - 0.0749
RADS	Neptunium-237	pCi/g	--	--	--	0/29	N/A	N/A	--	1.83E+00	--	1.83E+02	--	3.66E-01	--	3.66E+01	--	5.50E-03	--	1.10E-01	0.0469 - 0.125
RADS	Neptunium-239	pCi/g	--	--	--	0/27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.266 - 1.33
RADS	Plutonium-238	pCi/g	--	--	--	0/29	N/A	N/A	--	3.90E-01	--	3.90E+01	--	7.81E-02	--	7.81E+00	--	8.58E-03	--	1.72E-01	0.00924 - 0.232
RADS	Plutonium-239/240[g]	pCi/g	--	--	--	0/29	N/A	N/A	--	1.44E+00	--	1.44E+02	--	2.87E-01	--	2.87E+01	--	3.32E-02	--	6.64E-01	0.0127 - 0.0862
RADS	Potassium-40	pCi/g	4.51E+00	1.33E+01	8.75E+00	26/27	0/27	1.60E+01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.286 - 0.647
RADS	Protactinium-234m	pCi/g	--	--	--	0/27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.16 - 9.74
RADS	Radium-226	pCi/g	4.58E-01	5.91E-01	5.02E-01	4/27	0/27	1.50E+00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.116 - 0.388
RADS	Technetium-99	pCi/g	--	--	--	0/29	--	2.80E+00	--	1.66E+03	--	1.66E+05	--	3.32E+02	--	3.32E+04	--	7.60E-03	--	1.52E-01	0.536 - 3.12
RADS	Thorium-228	pCi/g	1.18E-01	5.88E-01	4.02E-01	29/29	0/29	1.60E+00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0152 - 0.0125
RADS	Thorium-230	pCi/g	1.94E-01	5.17E-01	3.63E-01	28/29	0/29	1.40E+00	8/29	4.02E-01	0/29	4.02E+01	28/29	8.04E-02	0/29	8.04E+00	28/29	5.31E-02	0/29	1.06E+00	0.0177 - 0.134
RADS	Thorium-232	pCi/g	1.30E-01	5.96E-01	4.00E-01	29/29	0/29	1.50E+00	12/29	4.29E-01	0/29	4.29E+01	29/29	8.57E-02	0/29	8.57E+00	29/29	1.16E-01	0/29	2.32E+00	0.0166 - 0.0665
RADS	Uranium-234	pCi/g	2.61E-01	3.50E-01	3.06E-01	2/18	0/18	1.20E+00	0/18	3.98E-01	0/18	3.98E+01	2/18	7.97E-02	0/18	7.97E+00	2/18	1.09E-03	2/18	2.17E-02	0.117 - 3.27
RADS	Uranium-238	pCi/g	3.47E-01	6.66E-01	5.07E-01	2/18	0/18	1.20E+00	1/18	3.91E-01	0/18	3.91E+01	2/18	7.83E-02	0/18	7.83E+00	2/18	1.06E-03	2/18	2.12E-02	0.0462 - 1.96
SVOA	1,2,4-Trichlorobenzene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	1,2-Dichlorobenzene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	1,2-Diphenylhydrazine	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	1,3-Dichlorobenzene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	1,4-Dichlorobenzene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2,4,5-Trichlorophenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2,4,6-Trichlorophenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2,4-Dichlorophenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2,4-Dimethylphenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2,4-Dinitrophenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2,4-Dinitrotoluene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2,6-Dichlorophenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2,6-Dinitrotoluene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2-Chloronaphthalene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2-Chlorophenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2-Methyl-4,6-dinitrophenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5

Table 5. Subsurface Soil Data Summary (1–16 ft bgs) (Continued)

Type	Analysis	Unit	Detected Results			FOD	Provisional Background		Excavation Worker		Excavation Worker		Outdoor Worker		Outdoor Worker		GW Protection Screen				DL Range
			Min	Max	Avg		FOE	Bkgd	FOE	NAL	FOE	AL	FOE	NAL	FOE	AL	FOE	DAF 1	FOE	DAF 20	
SVOA	2-Methylnaphthalene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2-Methylphenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2-Nitrobenzenamine	mg/kg	--	--	--	0/26	N/A	N/A	--	1.89E+02	--	5.67E+03	--	1.89E+02	--	5.67E+03	--	8.01E-03	--	1.60E-01	0.43 - 0.5
SVOA	2-Nitrophenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	3,3'-Dichlorobenzidine	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	3-Nitrobenzenamine	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	4-Bromophenyl phenyl ether	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	4-Chloro-3-methylphenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	4-Chlorobenzenamine	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	4-Chlorophenyl phenyl ether	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	4-Methylphenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	4-Nitrophenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Acenaphthene	mg/kg	--	--	--	0/28	N/A	N/A	--	1.01E+03	--	3.03E+04	--	1.01E+03	--	3.03E+04	--	5.49E-01	--	1.10E+01	0.43 - 0.5
SVOA	Acenaphthylene	mg/kg	--	--	--	0/28	N/A	N/A	--	1.01E+03	--	3.03E+04	--	1.01E+03	--	3.03E+04	--	5.49E-01	--	1.10E+01	0.43 - 0.5
SVOA	Anthracene	mg/kg	--	--	--	0/28	N/A	N/A	--	5.05E+03	--	1.00E+05	--	5.05E+03	--	1.00E+05	--	5.81E+00	--	1.16E+02	0.43 - 0.5
SVOA	Benzenemethanol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Benzo(ghi)perylene	mg/kg	--	--	--	0/28	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Benzoic acid	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Bis(2-chloroethoxy)methane	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Bis(2-chloroethyl) ether	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Bis(2-chloroisopropyl) ether	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Bis(2-ethylhexyl)phthalate	mg/kg	--	--	--	0/26	N/A	N/A	--	1.90E+02	--	1.14E+04	--	3.79E+01	--	3.79E+03	--	1.33E+00	--	2.66E+01	0.43 - 0.5
SVOA	Butyl benzyl phthalate	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Carbazole	mg/kg	--	--	--	0/26	N/A	N/A	--	6.73E+02	--	2.02E+04	--	6.73E+02	--	2.02E+04	--	5.45E-01	--	1.09E+01	0.43 - 0.5
SVOA	Di-n-butyl phthalate	mg/kg	5.00E-01	7.00E+00	1.56E+00	13/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Di-n-octylphthalate	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Dibenzofuran	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Diethyl phthalate	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Dimethyl phthalate	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Fluoranthene	mg/kg	--	--	--	0/28	N/A	N/A	--	6.73E+02	--	2.02E+04	--	6.73E+02	--	2.02E+04	--	8.91E+00	--	1.78E+02	0.43 - 0.5
SVOA	Fluorene	mg/kg	--	--	--	0/28	N/A	N/A	--	6.73E+02	--	2.02E+04	--	6.73E+02	--	2.02E+04	--	5.45E-01	--	1.09E+01	0.43 - 0.5
SVOA	Hexachlorobenzene	mg/kg	--	--	--	0/26	N/A	N/A	--	3.29E-01	--	9.86E+00	--	3.29E-01	--	9.86E+00	--	1.23E-04	--	2.46E-03	0.43 - 0.5
SVOA	Hexachlorobutadiene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Hexachlorocyclopentadiene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Hexachloroethane	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Isophorone	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	N-Nitroso-di-n-propylamine	mg/kg	--	--	--	0/26	N/A	N/A	--	3.79E-01	--	3.79E+01	--	7.58E-02	--	7.58E+00	--	8.10E-06	--	1.62E-04	0.43 - 0.5
SVOA	N-Nitrosodimethylamine	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	N-Nitrosodiphenylamine	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Naphthalene	mg/kg	--	--	--	0/28	N/A	N/A	--	1.67E+01	--	1.67E+03	--	3.34E+00	--	3.34E+02	--	3.85E-04	--	7.70E-03	0.43 - 0.5
SVOA	Nitrobenzene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Pentachlorophenol	mg/kg	--	--	--	0/26	N/A	N/A	--	4.06E+00	--	4.06E+02	--	8.11E-01	--	8.11E+01	--	5.71E-05	--	1.14E-03	0.43 - 0.5
SVOA	Phenanthrene	mg/kg	--	--	--	0/28	N/A	N/A	--	5.05E+02	--	1.52E+04	--	5.05E+02	--	1.52E+04	--	1.32E+00	--	2.63E+01	0.43 - 0.5
SVOA	Phenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Pyrene	mg/kg	--	--	--	0/28	N/A	N/A	--	5.05E+02	--	1.52E+04	--	5.05E+02	--	1.52E+04	--	1.32E+00	--	2.63E+01	0.43 - 0.5
SVOA	Pyridine	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Total PAHs[b]	mg/kg	--	--	--	0/28	N/A	N/A	--	2.35E+00	--	1.51E+02	--	4.71E-01	--	4.71E+01	--	2.94E-02	--	5.89E-01	0 - 0
SVOA	p-Nitroaniline	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5

One or more samples exceed AL value

One or more samples exceed NAL value

One or more samples exceed background value

One or more samples exceed groundwater protection screening

Notes:

-- = No calculation completed, analyte not detected

[a] Chromium (III) values are shown for information purposes

[a] Chromium uses NAL/AL for Chromium (VI)

[f] Lead uses DAF screening values based on the MCL

[d] Uranium (Insoluble Compounds) values are shown for information purposes

[e] Uranium uses NAL/AL for Uranium (Soluble Salts)

[c] Total PCBs calculated by laboratory

[c] Plutonium-239/240 screened against Plutonium-240 values

[b] Total PAHs calculated using toxicity equivalence factor values in Human Health RMD (DOE 2024b)

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Table 6. Groundwater Data Summary—McNairy Formation

Type	Analysis	Unit	Detected Results			FOD	Provisional Background		MCL		DL Range
			Min	Max	Avg		FOE	Bkgd	FOE	MCL	
METAL	Uranium[a]	mg/L	9.10E-05	9.10E-05	9.10E-05	1/7	0/7	1.00E-03	0/7	3.00E-02	0.0002 - 0.0002
METAL	Uranium[b]	mg/L	9.10E-05	9.10E-05	9.10E-05	1/7	0/7	1.00E-03	0/7	3.00E-02	0.0002 - 0.0002
RADS	Technetium-99	pCI/L	--	--	--	0/7	--	7.80E+00	--	9.00E+02	13.9 - 20.2
VOA	1,1,1-Trichloroethane	mg/L	--	--	--	0/7	N/A	N/A	--	2.00E-01	0.001 - 0.001
VOA	1,1,2-Trichloroethane	mg/L	--	--	--	0/7	N/A	N/A	--	5.00E-03	0.001 - 0.001
VOA	1,1-Dichloroethane	mg/L	--	--	--	0/7	N/A	N/A	--	N/A	0.001 - 0.001
VOA	1,1-Dichloroethene	mg/L	--	--	--	0/7	N/A	N/A	--	7.00E-03	0.001 - 0.001
VOA	1,2-Dichloroethane	mg/L	--	--	--	0/7	N/A	N/A	--	5.00E-03	0.001 - 0.001
VOA	Benzene	mg/L	--	--	--	0/7	N/A	N/A	--	5.00E-03	0.001 - 0.001
VOA	Bromodichloromethane	mg/L	--	--	--	0/7	N/A	N/A	--	8.00E-02	0.001 - 0.001
VOA	Carbon tetrachloride	mg/L	--	--	--	0/7	N/A	N/A	--	5.00E-03	0.001 - 0.001
VOA	Chloroform	mg/L	--	--	--	0/7	N/A	N/A	--	8.00E-02	0.001 - 0.001
VOA	*cis* -1,2-Dichloroethene	mg/L	--	--	--	0/7	N/A	N/A	--	7.00E-02	0.001 - 0.001
VOA	Ethylbenzene	mg/L	--	--	--	0/7	N/A	N/A	--	7.00E-01	0.001 - 0.001
VOA	Tetrachloroethene	mg/L	--	--	--	0/7	N/A	N/A	--	5.00E-03	0.001 - 0.001
VOA	Toluene	mg/L	--	--	--	0/7	N/A	N/A	--	1.00E+00	0.001 - 0.001
VOA	Total Xylene	mg/L	--	--	--	0/7	N/A	N/A	--	1.00E+01	0.003 - 0.003
VOA	*trans* -1,2-Dichloroethene	mg/L	--	--	--	0/7	N/A	N/A	--	1.00E-01	0.001 - 0.001
VOA	Trichloroethene	mg/L	4.00E-04	1.26E-03	9.03E-04	3/7	N/A	N/A	0/7	5.00E-03	0.001 - 0.001
VOA	Vinyl chloride	mg/L	--	--	--	0/7	N/A	N/A	--	2.00E-03	0.001 - 0.001

One or more samples exceed Background value

One or more samples exceed MCL

Notes:

-- = No calculation completed, analyte not detected

[a] Uranium (Insoluble Compounds) values are shown for information purposes

[b] Uranium uses NAL/AL for Uranium (Soluble Salts)

7.2.3. Analytical Results for Chemical Data in Sediment

Due to the sediment sampling being collected prior to 2014, the data are considered only qualitatively in this evaluation. Metals that were detected (aluminum, barium, beryllium, calcium, chromium, copper, nickel, uranium, vanadium, and zinc) were all less than the respective background values for surface soil (there is no site-specific background established for sediment). There were no detections of PCBs, SVOCs, or VOCs in the two sediment samples.

7.2.4. Evaluation of Chemical Results

7.2.4.1 Soil—Surface and Subsurface

For the surface and subsurface soil sample results shown in Tables 4 and 5, there were detections of 12 metals (aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium, lead, manganese, silver, sodium, and zinc) that exceed the associated Paducah Site provisional background values. The metals that most frequently exceeded provisional background (exceeded in > 5% of the sample analyses) were aluminum, arsenic, cadmium, calcium, chromium, manganese, and sodium. The ranges of detected values of the metals that exceed provisional background values are compared to metal concentrations reported for Kentucky soils, as presented in the *Kentucky Guidance for Ambient Background Assessment*, in Table 7 (KDEP 2004). For chemicals and radionuclides that exceed background to the extent that contamination is suspected, as well as for organic chemicals that have been detected, the data are further evaluated in the risk screening in Section 7.4.

Table 7. Constituents Exceeding Background Compared to Kentucky Soils Range

Constituent	Horizon with Exceedance (ft bgs)	Property Soil Data Range (mg/kg)	Kentucky Soils*	
			Data Range (mg/kg)	95th Percentile (mg/kg)
Aluminum	0–1; 1–16	4,470–14,300	1,290–38,100	21,000
Arsenic	1–16	5.01–13.6	0.059–55.5	21.2
Barium	1–16	27.3–1,700	6.14–1,160	241
Beryllium	0–1	0.468–0.765	0.061–3.57	1.8
Cadmium	0–1	2.51–3.15	0.004–9.46	3.9
Calcium	1–16	398–102,000	N/A	N/A
Chromium	0–1	5.73–33.9	2.83–168	40
Lead	0–1; 1–16	12.1–38.4	0.03–284	84.6
Manganese	0–1	383–1,828	8.43–5,100	2,620
Silver	0–1	4.0 (1 detect)	0.006–5.2	1.2
Sodium	0–1	343 (1 detect)	N/A	N/A
Zinc	1–16	23.6–60.5	6–470	115

**Kentucky Guidance for Ambient Background Assessment* (KDEP 2004).

Barium, beryllium, calcium, lead, silver, and zinc results in surface and subsurface soil samples combined exceeded their respective provisional background values in < 5% of the samples. Analytes exceeding the Paducah Site provisional background values were also evaluated against KDEP ambient background values (KDEP 2004). The criteria for applying ambient background values, used previously at PGDP for soil piles, are as follows: (1) the mean site concentration of the analytes (based on detections) for Leasing Parcel A is below the 95% upper confidence limit (UCL) of the mean concentrations for KDEP background; (2) at least half of the data points are less than the 60th percentile value; and (3) no data points exceed the 95th percentile value. For the 12 metals exceeding background, seven of the metals (aluminum, arsenic, beryllium, chromium, lead, manganese, and zinc) meet all three criteria and, therefore, are not considered COPCs for Leasing Parcel A. Note that some of these metals are still considered in the risk evaluation

(Section 7.4) to assess overall protectiveness. Calcium and sodium are not listed with a generic statewide ambient background value, nor do these chemicals have risk-based action levels (ALs) or no action levels (NALs) because they are essential elements/nutrients (DOE 2024d); therefore, though calcium and sodium are present in Leasing Parcel A soil above background, they are not considered COPCs.

Barium. Barium results in surface soil samples did not exceed the background value of 200 mg/kg in any of the 15 samples. Barium results in subsurface soil samples exceeded the background value of 170 mg/kg in two of the 28 samples. The sample at location USFB-13 (1,700 mg/kg) was collected from a depth of 6 to 8 ft bgs and the sample at location USFB-14 (1,040 mg/kg) was collected from a depth of 11 to 15 ft bgs. The criteria for applying ambient background values established by KDEP for barium are as follows: (1) the mean site concentration for detects (146.1 mg/kg for surface and subsurface combined) is above the 95% UCL of the mean concentrations of KDEP background (116.9 mg/kg); (2) at least half of the data points are less than the 60th percentile value (100 mg/kg); and, (3) two data points are above the upper bound value (241 mg/kg). Because barium results exceeded the provisional background value and also exceeded two of the three KDEP ambient background criteria, barium is considered a COPC and is further evaluated in Section 7.4.

Cadmium. Cadmium was detected in four of the 15 surface soil samples and exceeded the background value of 0.21 mg/kg in all four samples. Cadmium was not detected in the 28 subsurface samples collected from the 1 to 16 ft bgs horizon. The maximum detected value in the samples was 3.15 mg/kg. The criteria for applying ambient background values established by KDEP for cadmium are as follows: (1) the mean site concentration (for detects) (2.8 mg/kg) is above the 95% UCL of the mean concentrations of KDEP background (0.78 mg/kg); (2) at least half of the data points are greater than the 60th percentile (0.27 mg/kg); but (3) no data points were above the upper bound value (3.9 mg/kg). Cadmium failed the first two criteria and is considered a COPC for Leasing Parcel A. With regard to the second criteria, the DLs (or practical quantitation limits in this case) ranged from 2 to 2.48 mg/kg, substantially above the 60th percentile of 0.27 mg/kg.

Silver. Silver was detected only once out of 43 samples with the surface soil sample result of 4 mg/kg exceeding the background value of 2.3 mg/kg. The criteria for ambient background values established by KDEP for silver are as follows: (1) the mean site concentration for detects (4 mg/kg with only one detect) is > the 95% UCL of the mean concentrations of KDEP background (0.45 mg/kg); (2) at least half of the data points are greater than the 60th percentile (0.257 mg/kg); and, (3) the one detection exceeded the 95th percentile value (1.2 mg/kg). Because silver results exceeded the provisional background value and also failed the KDEP ambient background criteria, silver is considered a COPC and is further evaluated in Section 7.4. With regard to the second criteria, the practical quantitation limits for silver ranged from 1.93 to 4 mg/kg, substantially above the 60th percentile of 0.257 mg/kg.

PCBs and Other Organics. PCBs were detected in three of 28 subsurface soil samples but were not detected in the 15 surface soil samples. The maximum result in the subsurface soil was 0.3 mg/kg. The detections occurred at location USFB-11 (at depth intervals of 1 to 5 ft bgs and 6 to 10 ft bgs) and location USFB-12 (at a depth interval of 11 to 15 ft bgs). PCBs were not detected at deeper intervals in either boring. PCBs were also detected in one of the 20 cylinder storage yard characterization samples of surface soil collected in 1995. Sample location C-745-T-65 had a PCB result of 0.2 mg/kg (the detection was from Aroclor-1254). Total PAHs were not detected in 10 surface soil samples or 28 subsurface samples in Leasing Parcel A soil. As a result, PAHs are not considered COPCs for this evaluation. The only other organic compounds detected in soil were low levels of phthalate compounds [bis(2-ethylhexyl)phthalate and di-n-butyl phthalate were detected] and acetone. Phthalates and acetone are often considered potential laboratory contaminants.

7.2.4.2 Groundwater

Groundwater samples from MW120, a McNairy Formation MW located adjacent to Leasing Parcel A, were screened against provisional groundwater background values (using the "Over Wells" value) and primary MCLs provided in the Human Health RMD, where applicable (DOE 2024d). For MW120, there were eight sampling events between March 2020 and September 2024, which are summarized in Table 6. Samples are analyzed for uranium, technetium-99, and VOCs. There was one detection of uranium of 0.000091 mg/L (in March 2020), which is less than the provisional background value and the MCL. There were three detections of TCE with a maximum detection of 0.00126 mg/L, which is less than the MCL of 0.005 mg/L.

Leasing Parcel A is located within the Water Policy boundary (Figure 13), which mitigates exposure to contaminated groundwater. Any lease of Leasing Parcel A will contain a groundwater restriction that prohibits extraction and use.

7.2.4.3 Sediment

As noted previously, metals that were detected in samples from the two sediment locations (aluminum, barium, beryllium, calcium, chromium, copper, nickel, uranium, vanadium, and zinc) were below the respective background values for surface soil. There were no detections of PCBs, SVOCs, or VOCs in the two sediment samples.

7.3. RADIOLOGICAL SURVEY AND DATA RESULTS

7.3.1. Data Sources for Radiological Surveys

Data are available from several radiological surveys. Survey results were available from the sources discussed below.

Aerial Radiological Surveys

Radiological surveys of PGDP were conducted in 1976 and 1990. The purpose of those surveys was to determine the extent to which plant operations may have impacted the radiological signature of the plant surroundings. Another aerial radiological survey was conducted over PGDP and the surrounding area from October 28, 2009, to November 2, 2009. The purpose of the last survey was to measure the terrestrial radiological environment within and around PGDP in order to update previous aerial radiological survey data from 1976. The aerial survey used a large array of helicopter-mounted sodium iodide gamma ray detectors. The aerial survey was flown at an altitude of approximately 150 ft along a series of parallel lines spaced 250 ft apart and encompassing an area of approximately 25 square miles bordered on the north by the Ohio River (DOE 2015b).

No significant man-made gamma activity was detected outside the Limited Area boundary during the aerial survey. The areas with the greatest activity at PGDP are cylinder storage yards located near the southern portion of PGDP (radiation emissions near the cylinder storage yards are informally referred to as "shine") along the north-central portion of Leasing Parcel A.

Sitewide Evaluation for the Soils OU

Radiological and visual walkover surveys were conducted over DOE-owned property (including property licensed to the Commonwealth of Kentucky), encompassing an area of approximately 2,676 acres. The purpose of these surveys was to visually identify anomalies and to complete a radiological scoping survey

of the entire area with a targeted radiological survey of identified anomalies (DOE 2011). These surveys were completed between January 5, 2009, and April 23, 2010.

DOE completed the 2009–2010 surveys, and no new contaminated areas were identified, no areas were found to have radiological readings greater than twice instrument background, and no areas required action based on criteria established in the *Sitewide Evaluation Work Plan at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0228&D2 (DOE 2011). Consistent with the FFA (EPA 1998a) and the approaches set forth in the National Contingency Plan, the results of the sitewide evaluation determined that no removal or remedial actions were required for the 534 anomalies identified within DOE property (outside of the Limited Area), and there was no need to establish SWMU assessment reports (DOE 2015b).

Figure 15 provides the results of the radiological walkover survey within Leasing Parcel A. For the data shown in Figure 15, there were 25,287 measurements with the net gamma counts per minute (cpm) ranging from 91 to 17,358 cpm. The highest measurements, represented in the figure by measurements greater than the 95th percentile of the data set, reflects the interference from the cylinder storage yard shine, which prevents an accurate measurement of surficial soil levels near the cylinder storage yards.

The conclusion from the evaluation of the results of the surveys and their associated analyses is that no areas were identified that required either further CERCLA evaluation under the FFA or designation as SWMUs or AOCs (DOE 2015b). The results demonstrate that these anomalies do not represent unknown areas of contamination that pose a threat to the public or environment.

7.3.2. Analytical Results for Radiological Data in Soil

A summary of the analytical radiological data for surface and subsurface soil, which includes comparisons to background values and risk screening values, is provided in Tables 4 and 5, respectively.

7.3.3. Analytical Results for Radiological Data in Groundwater

A summary of the groundwater detections of radionuclides in the McNairy Formation MW, which includes comparisons to background and MCLs, is provided in Table 6. Technetium-99 is the only radionuclide analyzed for the evaluated data set, and it was not detected.

7.3.4. Analytical Results for Radiological Data in Sediment

Due to the sediment sampling being collected prior to 2014, the data are considered only qualitatively in this evaluation. All radionuclides were less than their respective site background values, where applicable, with the exception of uranium-234 and uranium-238 at location JP-0164. At this location, the activity-based concentration of uranium-234 [1.37 picocuries per gram (pCi/g)] and uranium-238 (1.84 pCi/g) were less than two times their respective background values.

7.3.5. Evaluation of Radiological Data

7.3.5.1. Soil—Surface and Subsurface

For the surface and subsurface soil sample results shown in Tables 4 and 5, there were detections of two radionuclides (uranium-235/236 and uranium-238) that exceeded the associated Paducah Site provisional background values. There are several other radionuclides with site provisional background values that were detected, but they did not exceed background.

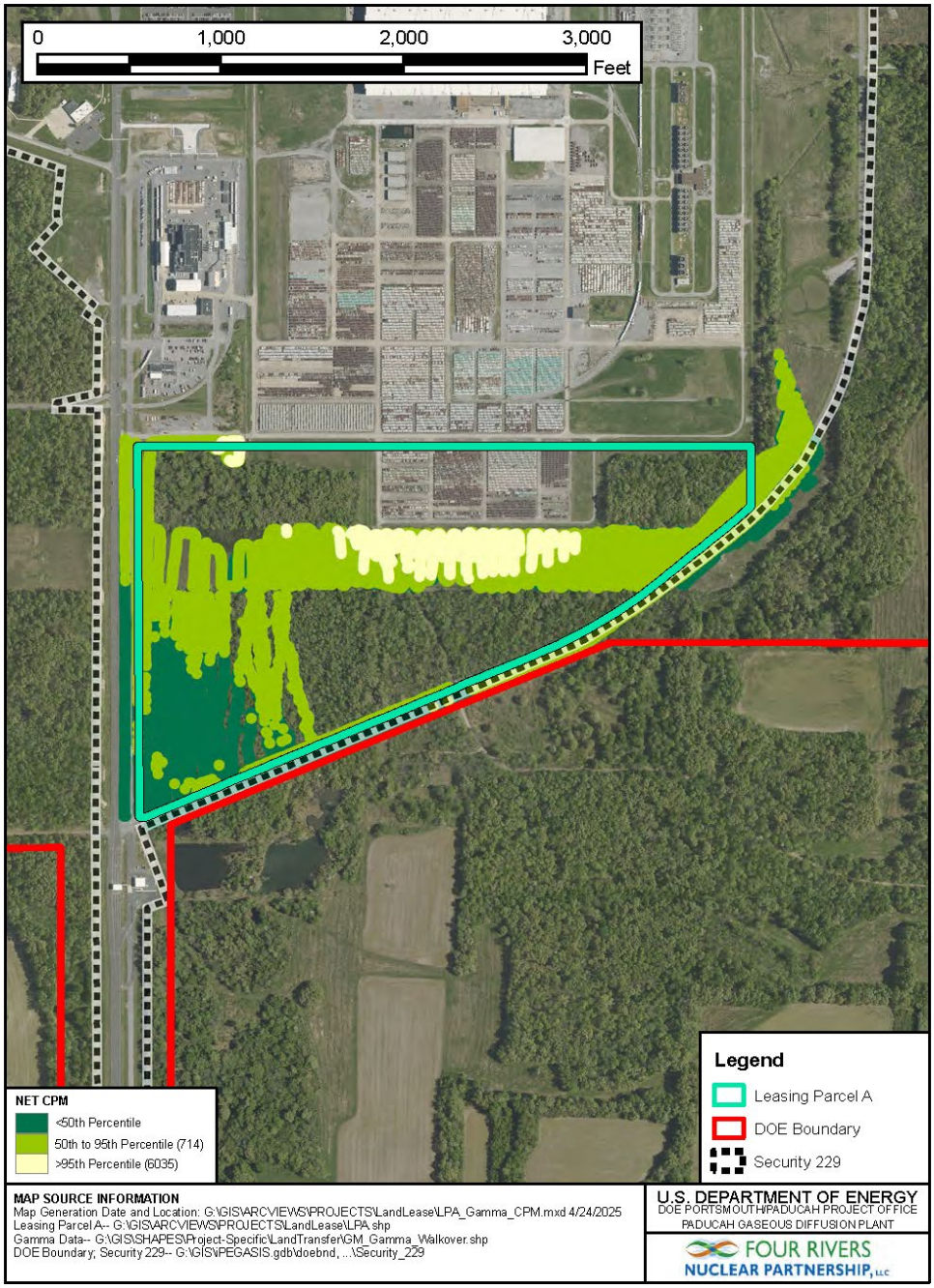


Figure 15. Historical Gamma Walkover Survey Results for Leasing Parcel A

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Uranium-235/236. Uranium-235/236 was analyzed in only one surface soil sample within Leasing Parcel A. The sample, collected from AOC 567, adjacent to Leasing Parcel A, during the Soils OU remedial investigation had a uranium-235/236 result (0.067 pCi/g) slightly exceeding the background value of 0.06 pCi/g. There were no subsurface samples analyzed for uranium-235/236. Uranium-235/236 is considered a site COPC and is further evaluated in Section 7.4.

Uranium-238. Uranium-238 values in surface soil samples exceeded the background value of 1.2 pCi/g in three of the nine samples from the Leasing Parcel A area with a maximum result of 1.57 pCi/g (the maximum detection was from a sample collected at AOC 567 east of Leasing Parcel A). Uranium-238 was detected in two of 18 subsurface soil samples (1 to 16 ft bgs) with no results exceeding the provisional background of 1.20 pCi/g. The maximum subsurface soil result was 0.666 pCi/g. Uranium-238 is considered a site COPC and is further evaluated in Section 7.4.

7.3.5.2. Groundwater

As shown in Table 6, the only radionuclide analyzed for in groundwater was technetium-99. Technetium-99 was analyzed in seven samples collected from MW120 between March 2020 and September 2024, and all were nondetect.

7.3.5.3. Sediment

Due to the sediment sampling being collected prior to 2014, the data are considered only qualitatively in this evaluation. All radionuclide results for sediment were less than their respective site surface soil background values, where applicable, with the exception of uranium-234 and uranium-238 at location JP-0164. At this location, the activity-based concentration of uranium-234 (1.37 pCi/g) and uranium-238 (1.84 pCi/g) were less than two times their respective surface soil background values.

7.4. SCREENING RISK EVALUATION

The goal of this screening risk evaluation is to determine if Leasing Parcel A proposed for leasing is protective of human health and the environment. Specifically, the objectives of this evaluation are the following:

1. Determine exposure to constituents based on available data for the surface and subsurface soils;

2. Use these data to provide an estimate of the potential for adverse effects to human health in a screening human health risk evaluation; and

3. Evaluate whether existing data justify a decision that site contaminants do not pose a risk to ecological receptors.

The screening human health risk methods utilized in this evaluation are taken from the Human Health RMD (DOE 2024d), which was developed based upon EPA's *Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A)* (EPA 1989), and the EPA *Region 4 Human Health Risk Assessment Supplemental Guidance* (EPA 2018a). The screening-level ecological risk assessment (SLERA) was performed consistent with the *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant Paducah, Kentucky, Volume 2, Ecological,* DOE/LX/07-0107&D2/R3/V2, (Ecological RMD) (DOE 2019), which was developed consistent with EPA ecological risk assessment guidance including *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (EPA 1997) and *Region 4 Ecological*

Risk Assessment Supplemental Guidance (EPA 2018b). The following sections describe the background information and data used for the risk evaluation.

This section presents an overview of the approaches used, a summary of the screening human health and ecological risk evaluation results, and the conclusions of the human health and ecological evaluations. The data available for Leasing Parcel A screening human health risk evaluation and SLERA consist of surface soil (human health and ecological) and subsurface soil (human health only) analytical results. The evaluation of human exposure to chemicals in soil includes the ingestion, dermal contact, and inhalation pathways (via airborne soil as dust and volatilization), and the evaluation of human exposure to radionuclides in soil includes the ingestion, external radiation, and dust inhalation pathways. Because the on-site workers would receive the highest levels of dust/volatile inhalation based on activities and proximity, on-site workers are conservative surrogates for off-site receptors who may inhale dust and volatiles originating from on-site soils. Groundwater is excluded from risk evaluation because there are no complete exposure pathways. The human exposure pathway for groundwater is incomplete because Leasing Parcel A is within the Water Policy Area. Ecological exposure pathways are incomplete because the underlying McNairy Formation groundwater does not discharge to the surface. Surface water is not evaluated, as there are no perennial surface water features on or adjacent to the property.

7.4.1. Screening Human Health Risk Evaluation Methodology

The screening human health risk evaluation methodology uses a stepwise process to determine if Leasing Parcel A under consideration is suitable (from a health perspective) for leasing. As detailed below, the site data are screened against Paducah Site background concentrations and risk-based, receptor-specific NAL concentrations found in the Human Health RMD at or below which no action is required. If the maximum detected concentration of an analyte exceeds the background and NAL during an initial screen, then the chemical or radiological constituent is retained as a COPC for further evaluation. The risk-based NALs were developed as screening levels based on an excess lifetime cancer risk (ELCR) of 1E-6 and a hazard quotient (HQ) of 0.1. Because the NALs are derived from PGDP-specific exposure parameter values for each receptor, NALs also can be used in the derivation of cumulative risk estimates as described in Appendix A of the Human Health RMD (see Appendix F, Section F.5.5.3) (DOE 2024d).

For analytes retained after the initial screening step, representative exposure point concentrations (EPCs) are used for the cumulative risk estimate rather than maximum detected concentrations. The 95% UCL on the arithmetic mean concentration is used as the EPC because the 95% UCL represents a protective estimate of the average concentration to which an individual would be exposed over time (EPA 1989). ProUCL software is used to calculate 95% UCL values, employing various statistical methods and providing recommended 95% UCL values based on the specific data set characteristics.[5]

The anticipated future land use for Leasing Parcel A is industrial; therefore, surface soil NALs were selected based on the industrial worker scenario and outdoor worker scenario (e.g., maintenance work, groundskeeping). Subsurface soil NALs are based on the outdoor worker scenario and excavation worker scenario, consistent with the Human Health RMD. The residential and recreational scenarios were not evaluated for purposes of the lease (restrictions will prohibit any residential or recreational uses of Leasing Parcel A).

The industrial receptor is a long-term, full-time indoor worker who works at the site under the expectation that Leasing Parcel A will be developed for industrial use. The outdoor worker receptor is a long-term, full-time indoor worker who works at the site and performs outdoor maintenance and groundskeeping tasks

[5] ProUCL (version 5.2) software is available at www.epa.gov/land-research/proucl-software.

that may require digging into the subsurface. The excavation worker scenario is for a shorter-term worker who digs into the subsurface soil (e.g., utility work).

The ELCR for a single COPC in soil is calculated as follows:

$$ELCR_1 = (EPC_1/NAL_{1c}) \times TR_{NAL} \qquad \text{Eq. 1}$$

Where:

$ELCR_1$ = ELCR associated with COPC "1."

EPC_1 = EPC of chemical "1" (mg/kg for chemicals; pCi/g for radionuclides).

NAL_{1c} = Carcinogenic NAL for COPC "1" (mg/kg for chemicals; pCi/g for radionuclides). Note that NAL values are receptor-specific as well as analyte-specific.

TR_{NAL} = Target risk used to calculate the NAL (1E-6).

The cumulative ELCR is simply the sum of individual COPC-specific ELCR values calculated as follows:

$$ELCR_{cum} = \sum (ELCR_1 + ELCR_2 + \ldots ELCR_n) \qquad \text{Eq. 2}$$

Where:

$ELCR_{cum}$ = Cumulative ELCR associated with all COPCs combined.
$ELCR_x$ = ELCR associated with each COPC.

It is noted that cancer risks associated with chemical COPCs and radiological COPCs are evaluated separately.

Analogous to calculation of the ELCR, the calculation of the noncancer hazard index (HI) for Paducah Site COPCs is calculated based on the noncancer NAL values, which are provided in Appendix A of the Human Health RMD. The noncancer-based NAL is the calculated exposure concentration for an HI of 0.1, using the chronic reference dose and the appropriate exposure values for the receptor and medium of interest (Human Health RMD). The HI for noncancer effects of a single COPC in an environmental medium is calculated as follows:

$$HI_1 = (EPC_1/NAL_{1n}) \times TH_{NAL} \qquad \text{Eq. 3}$$

Where:

HI_1 = HI associated with COPC "1."
EPC_1 = EPC of chemical "1" (mg/kg).
TH_{NAL} = Target HI used to calculate the NAL (0.1).
NAL_{1n} = Noncancer NAL for COPC "1" (mg/kg).

The total hazard index (THI) is the sum of individual COPC-specific HI values calculated as follows:

$$THI_{cum} = \sum (HI_1 + HI_2 + \ldots HI_x) \qquad \text{Eq. 4}$$

Where:

THI_{cum} = THI associated with all COPCs combined.
HI_x = HI associated with each COPC.

The THI is compared to a value of 1. EPA considers only those analytes that affect the same target organ to have additive effects (EPA 2018a, EPA 1989, ATSDR 2001); therefore, if the TIII exceeds a value of 1, cumulative HI values may be segregated by the target organ and then compared to a value of 1. The target organ-specific approach was not performed for Leasing Parcel A because the site-related TIII values did not exceed a value of 1.

Additionally, separate NALs were developed in the Human Health RMD for radiological COPCs depending on the assumed site conditions and time intervals. The Human Health RMD recommends the secular equilibrium (SE) NALs for the initial screening. The SE is the most protective scenario and assumes that the parent and all progeny are in equilibrium and that the parent COPC is continually being renewed (no source decay). Another protective option provided by the Human Health RMD is the infinite time source peak risk (PR). This scenario assumes that every radionuclide COPC present at the site is within its PR period.

For the uranium isotope COPCs, the period of PR occurs from between 185,000 to more than 3.500,000 million years into the future. Given that topsoil may form at the rate of a few inches per millennium, the contaminated soil would presumably be covered with tens or hundreds of feet of soil at the time of PR given an infinite time frame (Scalenghe et al. 2016). Such a soil covering would effectively eliminate exposure to currently uranium-contaminated surface soil.

As a more realistic alternative for the uranium isotope COPCs, NALs based on the 1,000-year PR are used in this evaluation and are regarded as most appropriate for uranium isotopes in soil. The SE NALs are also used to provide a range of values from which to calculate the ELCRs for radiological COPCs. The 1,000-year time frame of the 1,000-year PR NALs is consistent with DOE's requirements for disposal facilities for uranium and thorium wastes, which must be designed to remain effective for 1,000 years, to the extent reasonably achievable [DOE Order 458.1 Chg 4 (LtdChg), *Radiation Protection of the Public and the Environment*]. To accommodate the calculation of multiple radiological ELCR values, separate tables were used to evaluate radiological COPCs and chemical ELCRs, but the ELCRs for the chemical and radiological COPCs are combined to derive the total ELCR.

The NALs were selected to be protective concentrations and meet the definition under CERCLA 120(h) in that concentrations of contaminants below these levels would not pose a threat to human health. These screening levels also are consistent with KDEP risk assessment guidance (KDEP 2002). If there are constituents with concentrations in excess of the background soil concentrations and the NALs, further evaluation is conducted to ensure cumulative risks/hazards do not exceed acceptable risk/hazard ranges, consistent with land use. The specific exposure scenarios and corresponding NALs for this evaluation were selected based on site surveys and anticipated industrial use of Leasing Parcel A.

7.4.2. Screening Human Health Risk Evaluation Results

Risk screening was performed using the detected concentrations, PGDP background values, and the NAL values for each medium and human receptor evaluated. The initial screen uses the maximum detected

concentration. Analytes with maximum concentrations that exceed the NAL and background screening are identified as COPCs and are subject to an additional screening step whereby the 95% UCL on the mean concentration is compared to the cancer-based or noncancer-based NALs for the purpose of estimating the human health risk of that constituent from the additional cumulative risk evaluation. The risks of all other constituents evaluated in this second step are summed to determine whether the resulting cumulative ELCRs exceed the 1E-6 to 1E-4 cancer risk range and noncancer HIs exceed a value of 1. Additionally, constituents shown to be consistent with KDEP background soil levels (Sections 7.2.4 and 7.3.5) are identified as background-related. Separate total ELCR values and noncancer THI values are calculated that exclude the COPCs identified as background-related based on KDEP background soil levels.

7.4.2.1. Surface Soil Risks—Industrial Worker and Outdoor Worker

Table 4 presents the results for Leasing Parcel A initial surface soil risk screening evaluation based on industrial worker and outdoor worker exposure. The risk evaluation methods and results are summarized in the following paragraphs.

Industrial Worker Surface Soil Risks. Table 4 shows two metals and four radionuclides with one or more analytical laboratory detections that exceed their respective NAL for the industrial worker. None of the organics were detected at a concentration that exceeds an NAL. Of the analytes with an NAL exceedance, only one metal [chromium as Cr(VI)] and one radionuclide (uranium-238) were not attributable to background soil conditions during the initial screening of the maximum detected concentrations; therefore, these two analytes were evaluated for cumulative cancer risk, and chromium was evaluated for noncancer hazard. These analytes were identified as COPCs and their ELCR and noncancer HI estimated using the 95% UCL concentration as the EPC and equations 1 through 4 presented in Section 7.4.1.

Chemical cancer risks, radionuclide cancer risks, and noncancer hazards were evaluated for the industrial worker exposed to Leasing Parcel A surface soil using equations 1 through 4 presented above. The industrial worker total ELCR of the chemical COPCs in surface soil is 1.37E-6 (Table 8), which is at the low end of the CERCLA acceptable risk range. This total ELCR is based entirely on chromium, which is identified in Section 7.2.4 as background-related. Also, chromium is assumed to be present as 100% chromium VI [Cr(VI)], which is not a likely realistic assumption. Typically, Cr(VI) is a minor component of chromium in soil. The ELCR of chromium, with rounding as recommended by EPA (EPA 1989), equals the Kentucky target risk of 1E-6. The site-related total ELCR of chemicals in Leasing Parcel A surface soil is regarded as negligible (i.e., ELCR < 1E-6) for the industrial worker.

Table 8. Cancer Risk Evaluation of Surface Soil Chemical COPCs to the Industrial Worker

COPC	Units	95% UCL[a]	Industrial Cancer NAL[b]	Background Related?[c]	ELCR
Chromium as Cr(VI)[d]	mg/kg	16.79	1.23E+01	Yes	1.37E-06
Chromium as Cr(III)[e]	mg/kg	16.79	N/A	Yes	N/A
				Total ELCR	1.37E-06
				Total ELCR excluding background	[f]

[a] Calculated using ProUCL Version 5.2.
[b] NAL from the Human Health RMD (DOE 2024d).
[c] Based on evaluation presented in Section 7.2.4.
[d] NALs for Cr(VI) are used in Total ELCR calculations.
[e] NALs for Chromium III [Cr(III)] are presented for additional information.
[f] Chromium, the only chemical COPC, was identified in Section 7.2.4 as background-related.

The industrial worker radiological ELCR values based on the SE assumption and the 1,000-year PR assumption are 1.35E-5 and 2.01E-7, respectively (Table 9). The SE value is within the CERCLA

acceptable risk range and exceeds the Kentucky target risk of 1E-6. As described in Section 7.4.1, the SE-based values are regarded as unrealistic with respect to future soil exposure.

Table 9. Cancer Risk Evaluation of Surface Soil Radiological COPCs to the Industrial Worker

COPC	Units	95% UCL[a]	Industrial Cancer NAL—SE[b]	Industrial Cancer NAL—1,000-year PR[b]	Background related?[c]	ELCR—SE	ELCR—1,000-year PR
Uranium-238	pCi/g	1.29	9.53E-02	6.42E+00	No	1.35E-05	2.01E-07
					Total ELCR	1.35E-05	2.01E-07

[a] Calculated using ProUCL Version 5.2.
[b] NAL from the Human Health RMD (DOE 2024d).
[c] Based on evaluation presented in Section 7.3.5.

The 1,000-year PR industrial worker ELCR for the uranium isotopes is less than both the CERCLA acceptable risk range and the Kentucky target risk of 1E-6. Because the site-related risks to chemical COPC is negligible, the combined ELCR of chemical and radiological COPCs is less than the CERCLA acceptable risk range and the Kentucky target risk of 1E-6.

The noncancer THI for the industrial worker was 0.002 based on background-related chromium (Table 10). Because this value is < 1, adverse noncancer health effects are regarded as unlikely.

Table 10. Noncancer Risk Evaluation of Surface Soil COPCs to the Industrial Worker

COPC	Units	95% UCL[a]	Industrial Noncancer NAL[b]	Background Related?[c]	HI
Chromium as Cr(VI)[d]	mg/kg	16.79	1.00E+05	Yes	1.68E-05
Chromium as Cr(III)[e]	mg/kg	16.79	6.93E+02	Yes	2.42E-03
Uranium-238	pCi/g	1.29	N/A	No	N/A
				THI	0.002
				THI excluding background	[f]

[a] Calculated using ProUCL Version 5.2.
[b] NAL from the Human Health RMD (DOE 2024d).
[c] Based on evaluation presented in Sections 7.2.4 and 7.3.5.
[d] NALs for Cr(VI) are used in THI calculations.
[e] NALs for Cr(III) are presented for additional information.
[f] Chromium, the only COPC with a noncancer NAL, was identified in Section 7.2.4 as background-related.

In addition to comparisons of human health receptor scenarios, and consistent with implementing requirements of DOE Authorized Limits at the Paducah Site, radiological soil samples were compared to Authorized Limits for unrestricted release of the property to ensure protectiveness under DOE Order 458.1 Chg 4 (LtdChg) (DOE 2016b). The maximum detected concentration 1.57 pCi/g and the 95% UCL concentration (1.29 pCi/g) of uranium-238 were approximately two orders of magnitude less than the Paducah Authorized Limit for unrestricted use (135 pCi/g).

Outdoor Worker Surface Soil Risks. Table 4 shows that the maximum detected laboratory concentrations of four metals, four radionuclides, and zero organics in surface soil exceed the outdoor worker NALs. Of these, three metals (cadmium, chromium, and manganese) and one radionuclide (uranium-238) could not be attributed to background soil conditions based on the initial screening of maximum detected concentrations and were further evaluated for potential surface soil risk to the outdoor worker.

The outdoor worker total ELCR of the chemical COPCs in surface soil is 9.18E-6 (Table 11), which is within the CERCLA acceptable risk range but exceeds the Kentucky target risk of 1E-6. Virtually all of this ELCR is associated with chromium, which is identified in Section 7.2.4 as background-related. If background contributions of chromium are excluded, the resulting total ELCR of chemical contaminants is

1.97E-10, which is less than the CERCLA acceptable risk range and the Kentucky target risk of 1E-6. It is also noted that the chromium ELCR assumes that chromium is present as 100% Cr(VI), an overly protective assumption because Cr(VI) is typically a minor component of chromium in soils.

Table 11. Cancer Risk Evaluation of Surface Soil Chemical COPCs to the Outdoor Worker

COPC	Units	95% UCL[a]	Industrial Cancer NAL[b]	Background Related?[c]	ELCR
Cadmium	mg/kg	2.46	1.25E+04	No	1.97E-10
Chromium as Cr(VI)[d]	mg/kg	16.8	N/A	Yes	
Chromium as Cr(III)[e]	mg/kg	16.8	1.83E+00	Yes	9.17E-06
Manganese	mg/kg	1694	N/A	Yes	
				Total ELCR	9.18E-06
				Total ELCR excluding background	1.97E-10

[a] Calculated using ProUCL Version 5.2.
[b] NAL from the Human Health RMD (DOE 2024d).
[c] Based on evaluation presented in Section 7.2.4.
[d] NALs for Cr(VI) are used in Total ELCR calculations.
[e] NALs for Cr(III) are presented for additional information.

The radiological ELCR values for the outdoor worker exposed to surface soil, based on the SE assumption and the 1,000-year PR assumption are 1.65E-5 and 2.93E-7, respectively (Table 12). The SE value for the outdoor worker is within the CERCLA acceptable risk range and exceeds the Kentucky target risk of 1E-6. As described above, the SE-based values are regarded as unrealistic with respect to future soil exposure of uranium-238.

Table 12. Cancer Risk Evaluation of Surface Soil Radiological COPCs to the Outdoor Worker

COPC	Units	95% UCL[a]	Industrial Cancer NAL—SE[b]	Industrial Cancer NAL—1,000-year PR[b]	Background Related?[c]	ELCR—SE	ELCR—1,000-year PR
Uranium-238	pCi/g	1.29	7.83E-02	4.40E+00	No	1.65E-05	2.93E-07
					Total ELCR	1.65E-05	2.93E-07

[a] Calculated using ProUCL Version 5.2.
[b] NAL from the Human Health RMD (DOE 2024d).
[c] Based on evaluation presented in Section 7.3.5.

The 1,000-year PR ELCR for the uranium isotopes is less than both the CERCLA acceptable risk range and the Kentucky target risk of 1E-6. When combined with the site-related chemical ELCR (1.97E-10), the resulting ELCR of 2.93E-7 is unchanged and is within the CERCLA acceptable risk range.

The noncancer THI for the outdoor worker exposed to surface soil was 1.2, assuming 100% of chromium is present as Cr(VI) (Table 13). When rounded, as recommended by EPA (EPA 1989), this THI equals the target HI of 1, indicating that adverse noncancer health effects are unlikely for an outdoor worker exposed to surface soil. Note that the assumption of chromium as 100% Cr(VI) is unrealistic, because Cr(VI) is generally a minor component of chromium in soils. (If the chromium is assumed to be 100% Cr(III), the THI is 0.3, which is less than the target HI value of 1.) Further, chromium and manganese are identified as background-related in Section 7.2.4. If the background-related contributions of chromium and manganese are excluded, the site-related THI of 0.1 indicates likewise that exposure by an outdoor worker to site surface soil is unlikely to result adverse noncancer site-related health effects.

Table 13. Noncancer Risk Evaluation of Surface Soil COPCs to the Outdoor Worker

COPC	Units	95% UCL[a]	Industrial Noncancer NAL[b]	Background Related?[c]	HI
Cadmium	mg/kg	2.46	2.54E+00	No	9.68E-02
Chromium as Cr(VI)[d]	mg/kg	16.79	4.93E+04	Yes	3.41E-05
Chromium as Cr(III)[e]	mg/kg	16.79	1.83E+00	Yes	9.17E-01
Manganese	mg/kg	1,694.00	7.74E+02	Yes	2.19E-01
Uranium-238	pCi/g	1.29	N/A	No	N/A
THI [assuming all chromium is Cr(VI)]					1.2
THI [assuming all chromium is Cr(III)]					0.3
THI excluding background					0.10

[a] Calculated using ProUCL Version 5.2.
[b] NAL from the Human Health RMD (DOE 2024d).
[c] Based on evaluation presented in Section 7.3.5.
[d] NALs for Cr(VI) are used in THI calculations.
[e] NALs for Cr(III) are presented for additional information.

Evaluation of Surface Soil Protection of Groundwater. Detected surface soil concentrations were compared to soil screening concentrations with a dilution attenuation factor (DAF) of 1 (DAF 1) and of 20 (DAF 20) to evaluate protectiveness of soil concentrations to groundwater, assuming it to be a hypothetical drinking water source (Leasing Parcel A lies within the Water Policy Area). Two sets of DAF-based soil concentrations that are protective of groundwater are presented in the Human Health RMD—one DAF 1/DAF 20 set that was derived from the risk-based NAL and a second set that is based on the groundwater MCL, where available. Only the values derived from the NAL were used in the soil risk screen for protectiveness of groundwater (except in the case of lead, which are based on the MCL because lead has no risk-based groundwater NAL provided in the RMD). The DAF 1/DAF 20 values derived from the MCLs, which are generally higher than the corresponding NAL-based DAF 1/DAF 20 values presented in this evaluation, are included in the Human Health RMD as supplemental information. DAF 1 values are identified in the Human Health RMD as NALs. DAF 20 values are included as additional information. No soil-to-groundwater ALs are included in the Human Health RMD.

As shown in Table 4, numerous analytes detected in surface soil laboratory analytical samples have at least one exceedance of the DAF 1 value, and several of these also exceed the corresponding DAF 20 value. Three analytes (cadmium, silver, and uranium-238) were detected in surface soil with a DAF 1 exceedance and were not shown to be related to background soil conditions in Section 7.2.4 or Section 7.3.5. Each of these three analytes also have one or more DAF 20 exceedances. Neither cadmium nor silver, which was detected in only one of 15 samples, is an analyte of concern for McNairy Formation groundwater. Also, the only detection of uranium in McNairy Formation groundwater is an order of magnitude less than the provisional background level (Table 6), which indicates that uranium-238 is not of concern with respect to McNairy Formation groundwater.

The exceedance of a DAF 1 or DAF 20 value may indicate the potential for soil to adversely affect groundwater, and analytes with exceedances should be evaluated in conjunction with concentrations of these analytes observed in groundwater; however, an exceedance is not necessarily an indication that soil has adversely affected or may adversely affect the underlying groundwater. It is emphasized that the DAF 1 and DAF 20 values are not ALs and do not connote a specific risk level with respect to groundwater. Because Leasing Parcel A is in the Water Policy Area and because the analytes with DAF 1 and DAF 20 exceedances are not of concern with respect to McNairy Formation groundwater, further evaluation of surface soil with respect to groundwater protection is not warranted.

7.4.2.2. Subsurface Soil Risks—Outdoor Worker and Excavation Worker

Table 5 presents the results for Leasing Parcel A subsurface soil risk screening evaluation based on industrial worker and outdoor worker exposure. These results are summarized in the following paragraphs.

Outdoor Worker Subsurface Soil Risks. Table 5 shows that the maximum detected laboratory concentrations of four metals, one organic analyte, and four radionuclides in subsurface soil exceed the outdoor worker NALs. Of these, one metal (arsenic) and one organic (PCBs) could not be attributed to background soil conditions and were further evaluated for potential surface soil risk to the outdoor worker. The four radionuclides that exceeded an NAL were each attributed to background soil conditions.

The outdoor worker total ELCR of the chemical COPCs in subsurface soil is 9.13E-6 (Table 14). Because arsenic was identified as background-related in Section 7.2.4, the site-related total ELCR of 5.76 E-7 was calculated by excluding arsenic.

Table 14. Cancer Risk Evaluation of Subsurface Soil COPCs to the Outdoor Worker

COPC	Units	95% UCL[a]	Industrial Cancer NAL[b]	Background Related?[c]	ELCR
Arsenic	mg/kg	6.395	7.48E-01	Yes	8.55E-06
PCBs	mg/kg	0.129	2.24E-01	No	5.76E-07
				Total ELCR	9.13E-06
				Total ELCR excluding background	5.76E-07

[a] Calculated using ProUCL Version 5.2.
[b] NAL from the Human Health RMD (DOE 2024d).
[c] Based on evaluation presented in Section 7.2.4.

The noncancer THI for the outdoor worker exposed to subsurface soil was 0.09 including arsenic, which was identified as background-related in Section 7.2.4, and 0.04 excluding arsenic (Table 15). Both values are less than the target HI value of 1, indicating that adverse noncancer effects are unlikely for the outdoor worker exposed to Leasing Parcel A subsurface soil.

Table 15. Noncancer Risk Evaluation of Subsurface Soil COPCs to the Outdoor Worker

COPC	Units	95% UCL[a]	Industrial Noncancer NAL[b]	Background Related?[c]	HI
Arsenic	mg/kg	6.395	1.20E+01	Yes	5.33E-02
PCBs[d]	mg/kg	0.129	3.24E-01	No	3.98E-02
				THI	0.09
				THI excluding background	0.04

[a] Calculated using ProUCL Version 5.2.
[b] NAL from the Human Health RMD (DOE 2024d).
[c] Based on evaluation presented in Section 7.3.5.
[d] Noncancer NAL for PCB-1254 was used for PCBs.

Excavation Worker Subsurface Soil Risks. Table 5 shows that the maximum detected laboratory concentrations of three metals, three radionuclides, and no organics in subsurface soil exceed the excavation worker NALs. Of these, only arsenic could not be attributed to background soil conditions during the initial screening and was further evaluated for potential subsurface soil risk to the excavation worker.

The excavation worker total ELCR of the chemical COPC arsenic in subsurface soil is 1.71E-6 (Table 16). This value is within the CERCLA acceptable risk range and exceeds the Kentucky target risk of 1E-6. Because arsenic was identified as background-related in Section 7.2.4, the site-related total ELCR is regarded as negligible.

Table 16. Cancer Risk Evaluation of Subsurface Soil COPCs to the Excavation Worker

COPC	Units	95% UCL[a]	Industrial Cancer NAL[b]	Background Related?[c]	ELCR
Arsenic	mg/kg	6.395	3.74E+00	Yes	1.71E-06
				Total ELCR	1.71E-06
				Total ELCR excluding background	[d]

[a] Calculated using ProUCL Version 5.2.
[b] NAL from the Human Health RMD (DOE 2024d).
[c] Based on evaluation presented in Section 7.2.4.
[d] Arsenic, the only chemical COPC, was identified in Section 7.2.4 as background-related.

The noncancer THI for the outdoor worker exposed to subsurface soil was 0.05 including only arsenic (Table 17), which was identified as background-related in Section 7.2.4. This THI value is less than the target HI value of 1, indicating that adverse noncancer effects are unlikely for the excavation worker exposed to Leasing Parcel A subsurface soil.

Table 17. Noncancer Risk Evaluation of Subsurface Soil COPCs to the Excavation Worker

COPC	Units	95% UCL[a]	Industrial Noncancer NAL[b]	Background Related?[c]	HI
Arsenic	mg/kg	6.395	1.20E+01	Yes	5.33E-02
				THI	0.05
				THI excluding background	[d]

[a] Calculated using ProUCL Version 5.2.
[b] NAL from the Human Health RMD (DOE 2024d).
[c] Based on evaluation presented in Section 7.3.5.
[d] Arsenic, the only chemical COPC, was identified in Section 7.2.4 as background-related.

Evaluation of Subsurface Soil Protection of Groundwater. Detected subsurface soil concentrations were compared to DAF 1 and DAF 20 soil screening concentrations to evaluate protectiveness of soil concentrations to groundwater, assuming that it is a hypothetical drinking water source. Leasing Parcel A lies within the Water Policy boundary and groundwater use in this area currently is restricted. Two sets of DAF-based soil concentrations that are protective of groundwater are presented in the Human Health RMD—one DAF 1/DAF 20 set that was derived from the risk-based NAL and a second set that is based on the groundwater MCL, where available. Only the values derived from the NAL were used in the soil risk screen for protectiveness of groundwater (except in the case of lead, which are based on the MCL because lead has no risk-based groundwater NAL provided in the RMD). The DAF 1/DAF 20 values derived from the MCLs, which are generally higher than the corresponding NAL-based DAF 1/DAF 20 values presented in this evaluation, are included in the Human Health RMD as supplemental information. DAF 1 values are identified in the Human Health RMD as NALs. DAF 20 values are included as additional information. No soil-to-groundwater ALs are included in the Human Health RMD.

As shown in Table 5, numerous analytes detected in subsurface soil laboratory analytical samples have at least one exceedance of the DAF 1 value, and most of these also exceed the corresponding DAF 20 value. The only analyte detected in subsurface soil with a DAF 1 exceedance and that was not shown to be related to background soil conditions in previous sections is barium. Barium also has two exceedances of the DAF 20 value. No organics or radionuclides were detected at a maximum concentration that exceeds a DAF 1 or DAF 20 value.

The exceedance of a DAF 1 or DAF 20 value may indicate the potential for soil to adversely affect groundwater, and analytes with exceedances should be evaluated in conjunction with concentrations of these analytes observed in groundwater; however, an exceedance is not necessarily an indication that soil has adversely affected or may adversely affect the underlying groundwater. It is emphasized that the DAF 1

and DAF 20 values are not ALs and do not connote a specific risk level with respect to groundwater. Because Leasing Parcel A is in the Water Policy Area that restricts groundwater use and because barium has not been an analyte of concern with respect to McNairy Formation groundwater, further evaluation of subsurface soil with respect to protection of groundwater is not warranted.

7.4.3. Screening Level Ecological Risk Assessment Methodology

The SLERA was performed for Leasing Parcel A to evaluate whether existing data justify a decision that site contaminants do not pose a risk to ecological receptors or whether additional evaluation is necessary; therefore, the SLERA is conservative, erring on the side of environmental protection. The SLERA was conducted using the methods presented in the Ecological RMD (DOE 2019), consistent with the eight-step process developed by EPA for ecological risk assessment at Superfund sites (EPA 1997).

Leasing Parcel A SLERA includes the following elements of Steps 1 and 2 of the eight-step process.

- Screening-level problem formulation
- Screening-level effects evaluation
- Screening-level exposure estimate
- Screening-level risk calculation

7.4.3.1. Screening-Level Problem Formulation

Leasing Parcel A currently is approximately 103 acres and consists of approximately 55 acres of mature woodlands bisected generally east-to-west by a 23-acre power line right-of-way that is regularly maintained. A 10-acre portion of the cylinder storage yard is in the north-central part of the site. Aside from the cylinder storage yard, the property has no known uses. Some wetland areas are present in the western part of the parcel (Figure 6). Most of the wetland areas were characterized as including forested wetlands, ponds, wet meadows, vernal pools, and wetlands converted to agriculture (ANL 2004).

Wildlife commonly found at the Paducah Site consists of species indigenous to open grassland, thicket, and forest habitats. Small mammals found in the vicinity of the site include the southern short-tailed shrew, prairie vole, house mouse, rice rat, and deer mouse (KSNPC 1991). Large mammals commonly present in the area include coyote, eastern cottontail, opossum, groundhog, beaver, whitetail deer, raccoon, and gray squirrel. Mist netting activities in the area have captured red bats, little brown bats, Indiana bats, northern long-eared bats, evening bats, and eastern pipistrelles (KSNPC 1991). Typical birds of the area include European starling, cardinal, red-winged blackbird, mourning dove, bobwhite quail, turkey, killdeer, American robin, eastern meadowlark, eastern bluebird, blue jay, red-tail hawk, and great horned owl. Examples of a few amphibians and reptile species present include the cricket frog, Fowler's toad, common snapping turtle, green tree frog, chorus frog, southern leopard frog, eastern fence lizard, and red-eared slider (KSNPC 1991).

The following are the threatened and endangered species known, or potentially present, in the general vicinity of the Paducah Site (DOI 2013).

- Mammals—Indiana bat (*Myotis sodalis)*
- Birds—interior least tern (*Sterna antillarum*)
- Clams—fat pocketbook (Potamilus capax), orangefoot pimpleback (Plethobasus cooperanmus), pink mucket (Lampsilis abrupta), ring pink (Obovaria retusa), sheepnose (Plethobasus cyphyus), clubshell

(Pleurobema clava), fanshell (Cyprogenia stegaria), rough pigtoe (Pleurobema plenum), spectaclecase (Cumberlandia monodonta), and rabbitsfoot (Quadrula c. cylindrica)

7.4.3.2. Screening-Level Effects Evaluation

The screening-level effects evaluation identifies the chemical-specific toxicity threshold benchmarks for each environmental medium evaluated. These are PGDP NFA screening values presented in Appendix A of the Ecological RMD. An NFA represents a threshold concentration that, if exceeded, may represent a dose to one or more species that may result in an adverse ecological effect to an individual receptor.

7.4.3.3. Screening-Level Exposure Estimates

The SLERA is protective intentionally because its purpose is to evaluate whether existing data justify a decision that site contaminants do not pose a risk to ecological receptors. Consistent with this objective, the maximum detected concentrations are used to evaluate exposure.

7.4.3.4. Screening-Level Risk Calculation

The screening-level risk is calculated by dividing the maximum detected concentration by the NFA to derive the ecological HQ. Analytes that have maximum detected concentrations that exceed the respective NFAs and have resulting HQ values that exceed a value of 1.0 are identified as a chemicals or radionuclides of potential ecological concern (COPECs). Analytes that are not detected are screened against the NFAs to determine whether they are COPECs. A value of one-half the maximum DL is used as the concentration to screen against the NFA. Also, a value of one-half the maximum DL is used for screening detected analytes if this value exceeds the maximum detected concentration. The identification of a COPEC does not necessarily mean that the constituent represents an ecological threat, but rather that the COPEC requires further evaluation.

7.4.3.5. Screening Level Ecological Risk Assessment Results

A total of 20 metals, three SVOCs, and eight radionuclides were detected in Leasing Parcel A surface soil (Table 18).

The following seven metals and two organics had maximum detected concentrations in site surface soil that were greater than the NFA values and thus resulted in an HQ > 1.0. These nine analytes are identified as COPECs.

- Cadmium (HQ = 8.75)
- Chromium (HQ = 1.47)
- Lead (HQ = 3.49)
- Manganese (HQ = 8.31)
- Mercury (HQ=7.69)
- Vanadium (HQ = 4.47)
- Zinc (HQ = 1.25)
- Bis(2-ethylhexl)phthalate (HQ = 32.5)
- Di-n-butyl phthalate (HQ = 3091)

Table 18. Ecological Risk Initial Screening and Data Summary of Surface Soil

Analysis	Units	Detected Results		FOD	Location of Max	Ecological PGDP		DL Range	½ Max DL	Max Site	Maximum	COPEC?[f]
		Min	Max		Detected Conc.	FOE	NFA			Concentration[a]	HQ[b]	
Aluminum	mg/kg	4.47E+03	1.34E+04	15/15	K013406	N/A	N/A	20 - 199	9.95E+01	1.34E+04	N/A	NO
Antimony	mg/kg	--	--	0/15	N/A	N/A	0.27	8.06 - 20	1.00E+01	1.00E+01	**37.04**	YES
Arsenic	mg/kg	5.01E+00	7.29E+00	7/15	UFSB-18	N/A	18.00	4.87 - 5	2.50E+00	7.29E+00	0.41	NO
Barium	mg/kg	2.73E+01	1.97E+02	15/15	CCHS-03	N/A	330.00	2.44 - 5	2.50E+00	1.97E+02	0.60	NO
Beryllium	mg/kg	5.08E-01	7.65E-01	4/15	CCHS-03	N/A	2.50	0.487 - 0.5	2.50E-01	7.65E-01	0.31	NO
Cadmium	mg/kg	2.51E+00	3.15E+00	4/15	CCHS-03	4/15	0.36	2 - 2.48	1.24E+00	3.15E+00	**8.75**	YES
Calcium	mg/kg	3.98E+02	1.02E+05	15/15	UFSB-12	N/A	N/A	97.4 - 200	1.00E+02	1.02E+05	N/A	NO
Chromium	mg/kg	5.73E+00	3.39E+01	15/15	UFSB-13	1/15	23.00	2.44 - 2.5	1.25E+00	3.39E+01	**1.47**	YES
Cobalt	mg/kg	5.16E+00	8.16E+00	5/6	CCHS-03	N/A	13.00	2.5 - 4.96	2.48E+00	8.16E+00	0.63	NO
Copper	mg/kg	3.42E+00	1.07E+01	13/15	UFSB-20	N/A	28.00	2.5 - 12.4	6.20E+00	1.07E+01	0.38	NO
Iron	mg/kg	9.45E+03	1.74E+04	6/6	CCHS-03	N/A	N/A	19.5 - 20	1.00E+01	1.74E+04	N/A	NO
Lead	mg/kg	1.21E+01	3.84E+01	8/15	UFSB-12	8/15	11.00	4.87 - 20	1.00E+01	3.84E+01	**3.49**	YES
Magnesium	mg/kg	8.05E+02	2.70E+03	6/6	CCHS-04	N/A	N/A	4.87 - 15	7.50E+00	2.70E+03	N/A	NO
Manganese	mg/kg	3.83E+02	1.83E+03	6/6	CCHS-03	6/6	220.00	2.44 - 10	5.00E+00	1.83E+03	**8.31**	YES
Mercury	mg/kg	3.00E-02	3.00E-02	2/15	K013406	2/15	0.013	0.016 - 0.2	1.00E-01	1.00E-01	**7.69**	YES
Molybdenum	mg/kg	--	--	0/2	N/A	N/A	2.00	4.87 - 4.96	2.48E+00	2.48E+00	**1.24**	YES
Nickel	mg/kg	6.05E+00	1.31E+01	15/15	CCHS-03	0/15	38.00	4.87 - 5	2.50E+00	1.31E+01	0.34	NO
Potassium	mg/kg	4.29E+02	6.04E+02	4/4	CCHS-04	N/A	N/A	200 - 200	1.00E+02	6.04E+02	N/A	NO
Selenium	mg/kg	--	--	0/15	N/A	N/A	0.52	1 - 4.96	2.48E+00	2.48E+00	**4.77**	YES
Silver	mg/kg	4.00E+00	4.00E+00	1/15	CCHS-04	N/A	4.20	2.01 - 4	2.00E+00	4.00E+00	0.95	NO
Sodium	mg/kg	3.43E+02	3.43E+02	1/6	CCHS-03	N/A	N/A	195 - 200	1.00E+02	3.43E+02	N/A	NO
Thallium	mg/kg	--	--	0/15	N/A	N/A	0.05	9.74 - 20	1.00E+01	1.00E+01	**200.00**	YES
Uranium	mg/kg	--	--	0/6	N/A	N/A	25.00	4.87 - 200	1.00E+02	1.00E+02	**4.00**	YES
Vanadium	mg/kg	1.64E+01	3.49E+01	15/15	UFSB-20	15/15	7.80	2.44 - 2.5	1.25E+00	3.49E+01	**4.47**	YES
Zinc	mg/kg	2.76E+01	5.73E+01	15/15	UFSB-18	3/15	46.00	19.5 - 20	1.00E+01	5.73E+01	**1.25**	YES
Polychlorinated biphenyl	mg/kg	--	--	0/15	N/A	N/A	0.04	0.1 - 0.13	6.50E-02	6.50E-02	**1.59**	YES
Americium-241	pCi/g	--	--	0/16	N/A	N/A	2160.00	0.0156 - 0.377	1.89E-01	1.89E-01	0.00	NO
Americium-243	pCi/g	--	--	0/9	N/A	N/A	N/A	0.0492 - 0.159	7.95E-02	7.95E-02	N/A	NO
Cesium-134	pCi/g	--	--	0/13	N/A	N/A	N/A	0.0199 - 0.0608	3.04E-02	3.04E-02	N/A	NO
Cesium-137	pCi/g	5.56E-02	2.61E-01	15/16	UFSB-13	N/A	20.80	0.0239 - 0.099	4.95E-02	2.61E-01	0.01	NO
Cobalt-60	pCi/g	--	--	0/13	N/A	N/A	N/A	0.0203 - 0.0911	4.56E-02	4.56E-02	N/A	NO
Neptunium-237	pCi/g	--	--	0/16	N/A	N/A	814.00	0.024 - 0.871	4.36E-01	4.36E-01	0.00	NO
Neptunium-239	pCi/g	--	--	0/9	N/A	N/A	N/A	0.237 - 1.5	7.35E-01	7.35E-01	N/A	NO
Plutonium-238	pCi/g	--	--	0/16	N/A	N/A	1750.00	0.0094 - 0.235	1.18E-01	1.18E-01	0.00	NO
Plutonium-239/240[d]	pCi/g	--	--	0/16	N/A	N/A	1270.00	0.0131 - 0.0874	4.37E-02	4.37E-02	0.00	NO
Potassium-40	pCi/g	1.52E+00	1.19E+01	9/9	UFSB-16	N/A	N/A	0.232 - 0.804	4.02E-01	1.19E+01	N/A	NO
Protactinium-234m	pCi/g	--	--	0/9	N/A	N/A	N/A	4.26 - 10.7	5.35E+00	5.35E+00	N/A	NO
Radium-226	pCi/g	--	--	0/9	N/A	N/A	N/A	0.2 - 0.414	2.07E-01	2.07E-01	N/A	NO
Technetium-99	pCi/g	5.71E-01	5.71E-01	1/16	K013406	0/16	2190.00	0.41 - 3.12	1.56E+00	1.56E+00	0.00	NO
Thorium-228	pCi/g	1.01E-01	8.80E-01	16/16	SOU567-RAD	N/A	N/A	0.02 - 0.0952	4.76E-02	8.80E-01	N/A	NO
Thorium-230	pCi/g	2.51E-01	1.00E+00	16/16	SOU567-RAD	0/16	9980.00	0.016 - 0.138	6.90E-02	1.00E+00	0.00	NO
Thorium-232	pCi/g	9.40E-02	9.50E-01	16/16	SOU567-RAD	0/16	N/A	0.01 - 0.064	3.20E-02	9.50E-01	N/A	NO
Uranium-234	pCi/g	8.10E-01	8.10E-01	3/9	SOU567-RAD	0/9	5140.00	0.02 - 0.961	4.81E-01	8.10E-01	0.00	NO
Uranium-235/236[e]	pCi/g	6.70E-02	6.70E-02	1/1	SOU567-RAD	0/1	2750.00	0.021 - 0.021	1.05E-02	6.70E-02	0.00	NO
Uranium-238	pCi/g	1.22E+00	1.57E+00	5/9	SOU567-RAD	0/9	1570.00	0.009 - 1.15	5.75E-01	1.57E+00	0.00	NO
1,2,4-Trichlorobenzene	mg/kg	--	--	0/9	N/A	N/A	0.27	0.44 - 0.49	2.45E-01	2.45E-01	0.91	NO
1,2-Dichlorobenzene	mg/kg	--	--	0/9	N/A	N/A	0.09	0.44 - 0.49	2.45E-01	2.45E-01	**2.72**	YES
1,2-Diphenylhydrazine	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO

Table 18. Ecological Risk Initial Screening and Data Summary of Surface Soil (Continued)

Analysis	Units	Detected Results		FOD	Location of Max	Ecological PGDP		DL Range	½ Max DL	Max Site	Maximum	COPEC?[c]
		Min	Max		Detected Conc.	FOE	NFA			Concentration[a]	HQ[b]	
1,3-Dichlorobenzene	mg/kg	--	--	0/9	N/A	N/A	0.08	0.44 - 0.49	2.45E-01	2.45E-01	**3.06**	YES
1,4-Dichlorobenzene	mg/kg	--	--	0/9	N/A	N/A	0.88	0.44 - 0.49	2.45E-01	2.45E-01	0.28	NO
2,4,5-Trichlorophenol	mg/kg	--	--	0/9	N/A	N/A	4.00	0.44 - 0.49	2.45E-01	2.45E-01	0.06	NO
2,4,6-Trichlorophenol	mg/kg	--	--	0/9	N/A	N/A	9.94	0.44 - 0.49	2.45E-01	2.45E-01	0.02	NO
2,4-Dichlorophenol	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
2,4-Dimethylphenol	mg/kg	--	--	0/9	N/A	N/A	0.04	0.44 - 0.49	2.45E-01	2.45E-01	**6.13**	YES
2,4-Dinitrophenol	mg/kg	--	--	0/9	N/A	N/A	0.06	0.44 - 0.49	2.45E-01	2.45E-01	**4.02**	YES
2,4-Dinitrotoluene	mg/kg	--	--	0/9	N/A	N/A	6.00	0.44 - 0.49	2.45E-01	2.45E-01	0.04	NO
2,6-Dichlorophenol	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
2,6-Dinitrotoluene	mg/kg	--	--	0/9	N/A	N/A	4.00	0.44 - 0.49	2.45E-01	2.45E-01	0.06	NO
2-Chloronaphthalene	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
2-Chlorophenol	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
2-Methyl-4,6-dinitrophenol	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
2-Methylnaphthalene	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
2-Methylphenol	mg/kg	--	--	0/9	N/A	N/A	0.10	0.44 - 0.49	2.45E-01	2.45E-01	**2.45**	YES
2-Nitrobenzenamine	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
2-Nitrophenol	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
3,3'-Dichlorobenzidine	mg/kg	--	--	0/9	N/A	N/A	0.03	0.44 - 0.49	2.45E-01	2.45E-01	**8.17**	YES
3-Nitrobenzenamine	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
4-Bromophenyl phenyl ether	mg/kg	--	--	0/9	N/A	N/A	47.00	0.44 - 0.49	2.45E-01	2.45E-01	0.01	NO
4-Chloro-3-methylphenol	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
4-Chlorobenzenamine	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
4-Chlorophenyl phenyl ether	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
4-Methylphenol	mg/kg	--	--	0/9	N/A	N/A	0.08	0.44 - 0.49	2.45E-01	2.45E-01	**3.06**	YES
4-Nitrophenol	mg/kg	--	--	0/9	N/A	N/A	5.12	0.44 - 0.49	2.45E-01	2.45E-01	0.05	NO
Acenaphthene	mg/kg	--	--	0/11	N/A	N/A	see LMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Acenaphthylene	mg/kg	--	--	0/11	N/A	N/A	see LMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Anthracene	mg/kg	--	--	0/11	N/A	N/A	see LMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Benz(a)anthracene	mg/kg	--	--	0/11	N/A	N/A	see HMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Benzenemethanol	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
Benzo(a)pyrene	mg/kg	--	--	0/11	N/A	N/A	see HMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Benzo(b)fluoranthene	mg/kg	--	--	0/11	N/A	N/A	see HMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Benzo(ghi)perylene	mg/kg	--	--	0/11	N/A	N/A	see HMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Benzo(k)fluoranthene	mg/kg	--	--	0/11	N/A	N/A	see HMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Benzoic acid	mg/kg	--	--	0/9	N/A	N/A	0.01	0.44 - 0.49	2.45E-01	2.45E-01	**24.50**	YES
Bis(2-chloroethoxy)methane	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
Bis(2-chloroethyl) ether	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
Bis(2-chloroisopropyl) ether	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
Bis(2-ethylhexyl)phthalate	mg/kg	6.50E-01	6.50E-01	1/9	UFSB-19	1/9	0.02	0.44 - 0.49	2.45E-01	6.50E-01	**32.50**	YES
Butyl benzyl phthalate	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
Carbazole	mg/kg	--	--	0/9	N/A	N/A	0.07	0.44 - 0.49	2.45E-01	2.45E-01	**3.50**	YES
Chrysene	mg/kg	--	--	0/11	N/A	N/A	see HMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Dibenz(a,h)anthracene	mg/kg	--	--	0/11	N/A	N/A	see HMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Dibenzofuran	mg/kg	--	--	0/9	N/A	N/A	0.15	0.44 - 0.49	2.45E-01	2.45E-01	**1.63**	YES
Diethyl phthalate	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
Dimethyl phthalate	mg/kg	--	--	0/60	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
Di-n-butyl phthalate	mg/kg	9.50E-01	3.40E+01	6/9	UFSB-13	6/9	0.01	0.44 - 4.8	2.40E+00	3.40E+01	**3090.91**	YES
Di-n-octylphthalate	mg/kg	--	--	0/9	N/A	N/A	0.91	0.44 - 0.49	2.45E-01	2.45E-01	0.27	NO

Table 18. Ecological Risk Initial Screening and Data Summary of Surface Soil (Continued)

Analysis	Units	Detected Results		FOD	Location of Max	Ecological PGDP		DL Range	½ Max DL	Max Site	Maximum	COPEC?[c]
		Min	Max		Detected Conc.	FOE	NFA			Concentration[a]	HQ[b]	
Fluoranthene	mg/kg	--	--	7/81	N/A	N/A	see HMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Fluorene	mg/kg	--	--	0/106	N/A	N/A	see LMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Hexachlorobenzene	mg/kg	--	--	0/9	N/A	N/A	20.00	0.44 - 0.49	2.45E-01	2.45E-01	0.01	NO
Hexachlorobutadiene	mg/kg	--	--	0/9	N/A	N/A	0.01	0.44 - 0.49	2.45E-01	2.45E-01	**27.22**	YES
Hexachlorocyclopentadiene	mg/kg	--	--	0/9	N/A	N/A	0.00	0.44 - 0.49	2.45E-01	2.45E-01	**245.00**	YES
Hexachloroethane	mg/kg	--	--	0/9	N/A	N/A	0.02	0.44 - 0.49	2.45E-01	2.45E-01	**10.21**	YES
Indeno(1,2,3-cd)pyrene	mg/kg	--	--	0/11	N/A	N/A	see HMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Isophorone	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
N-Nitroso-di-n-propylamine	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
N-Nitrosodimethylamine	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
N-Nitrosodiphenylamine	mg/kg	--	--	0/9	N/A	N/A	0.55	0.44 - 0.49	2.45E-01	2.45E-01	0.45	NO
Naphthalene	mg/kg	--	--	0/11	N/A	N/A	see LMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Nitrobenzene	mg/kg	--	--	0/9	N/A	N/A	2.20	0.44 - 0.49	2.45E-01	2.45E-01	0.11	NO
Pentachlorophenol	mg/kg	--	--	0/9	N/A	N/A	2.10	0.44 - 0.49	2.45E-01	2.45E-01	0.12	NO
Phenanthrene	mg/kg	--	--	0/11	N/A	N/A	see LMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Phenol	mg/kg	--	--	0/9	N/A	N/A	0.79	0.44 - 0.49	2.45E-01	2.45E-01	0.31	NO
Pyrene	mg/kg	--	--	0/11	N/A	N/A	see HMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Pyridine	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
Total Low Molecular Weight (LMW) PAHs[f]	mg/kg	--	--	0/11	N/A	N/A	29.00	0.44 - 0.5	2.50E-01	2.50E-01	0.01	NO
PAHs[g]	mg/kg	--	--	0/11	N/A	N/A	1.10	0.44 - 0.5	2.50E-01	2.50E-01	0.23	NO

Shading indicates exceedances:
One or more samples exceeded NFA value

[a] Max Site Concentration is the greater of the maximum detected result and one-half the maximum detection limit.

[b] HQs that exceed a value of 1.0 are shown in bold italics and are identified as COPECs for further evaluation.

[c] COPEC? explanation:
"NO" indicates that the maximum site concentration does not exceed the NFA.
"YES" indicates that the NFA is exceeded.

[d] Plutonium-239/240 uses NFAs for plutonium-239.

[e] Uranium-235/236 uses NFAs for uranium-235.

[f] LMW PAHs are the sum of the detected results for acenaphthene; acenaphthylene; anthracene; fluorene; 1-methyl naphthalene; 2-methyl naphthalene; 2,6-dimethyl naphthalene; 2,3,5-trimethylnaphthalene; naphthalene; 1-methyl phenanthrene; and phenanthrene; if available.

[g] HMW PAHs are the sum of the detected results for benzo(a)anthracene; benzo(b)fluoranthene; benzo(k)fluoranthene; benzo(ghi)perylene; benzo(a)pyrene; benzo(e)pyrene; chrysene; dibenzo(a,h)anthracene; fluoranthene; indeno(1,2,3-cd)pyrene; perylene; and pyrene; if available.

Of the seven metals listed above, chromium, lead, manganese, and zinc were identified in Section 7.2.4 as being representative of background conditions. Note that for mercury, the HQ value shown is based on one-half the maximum DL because this value was greater than the maximum detected concentration. Bis(2-ethylhexy)phthalate and di-n-butyl phthalate are common laboratory contaminants. None of the radionuclides had maximum detected concentrations that exceed the NFAs; thus, none of these were identified as COPECs. In addition, Table 18 lists five metals and 14 organic analytes that were not detected in surface soil, but are identified as surface soil COPECs because one-half their respective maximum DLs exceeded the NFA.

Numerous detected and nondetected COPECs were identified as described in the preceding paragraphs based on exceedances of NFAs, which are intentionally selected as conservative values for an initial screening for the protection of ecological communities. The intended use of Leasing Parcel A is for industrial development and is not intended as habitat for wildlife; therefore, further evaluation of Leasing Parcel A for the protection of ecological communities is not necessary or appropriate.

7.4.3.6. Radiation and Dose

DOE Order 458.1, Chg 4 (LtdChg), has requirements in place to protect the public and environment from radiation exposure. DOE's external radiation monitoring program is designed to provide exposure data on direct radiation from DOE operations to members of the public. Figure 12 shows environmental dosimeter locations within, and adjacent to, Leasing Parcel A. The primary sources for radiation exposure in the parcel are the DUF_6 cylinder storage yards on the north side of the parcel.

DOE uses LANDAUER® InLight® EX-type environmental dosimeters to measure external gamma radiation at the monitoring locations, while location EDL-2 also uses a LANDAUER® Neutrak® Type E dosimeter to measure external neutron radiation. Environmental dosimeters are collected and analyzed quarterly. When the environmental dosimeters are collected, the following quarter's dosimeters are placed at the same locations.

Table 19 shows facility-related doses at each of the monitoring locations based on the 2024 dosimeter measurements. The quarterly facility-related dose (F_Q) is the dose received during a quarter at the monitoring location due to radiation from the facility, while the annual facility-related dose (F_A) is the dose received during a year at the monitoring location due to radiation. F_Q and F_A are represented as follows:

$$F_Q = M_Q - \sigma B_Q$$
$$F_A = M_A - \sigma B_A$$

Where:

M_Q = normalized quarterly field dose
σB_Q = representative baseline quarterly background dose
M_A = normalized annual dose
σB_A = representative baseline annual background dose

The facility-related doses in Table 19 exclude the background annual radiation dose of 91.5 millirem (mrem) (the background radiation dose is determined from 11 monitoring locations that are unaffected by Paducah Site operations).

Table 19. Facility-Related Dose at Monitoring Locations

Dosimeter Location	σB_Q (mrem)	M_Q (mrem)				$F_Q = M_Q \sigma B_Q$ (mrem)				σBA (mrem)	M_A (mrem)	$F_A = M_A \sigma B_A$ (mrem)
2024 Quarters →		1	2	3	4	1	2	3	4			
1	22.9	189.6	229.8	224.2	205.4	166.7	206.9	201.3	182.5	91.5	848.9	757.4
2		293.3	303.6	279.4	314.6	270.4	280.7	256.5	291.7		1,190.9	1,099.4
25		29.6	25.5	30.0	24.3	*	*	*	*		109.4	17.9
35		27.0	26.1	27.9	25.6	*	*	*	*		106.6	15.1
40		24.4	25.0	26.9	24.6	*	*	*	*		100.9	9.4
53		107.3	111.1	112.6	108.3	84.4	88.2	89.7	85.4		439.3	347.8
72		25.3	22.4	21.8	22.3	*	*	*	*		91.8	*

*Not detected, where M_Q or M_A is approximate to baseline/background.

Locations 1, 2, 25, and 53, which are situated on Leasing Parcel A, indicated a facility-related dose during the monitoring period with location EDL-2 having the highest annual facility-related dose at more than 1,000 mrem (note that DOE dose limits for general employees, from 10 *CFR* Part 835, *Occupational Radiation Protection*, have an annual limit of 5,000 mrem). These locations are closer to the perimeter of the DUF_6 facility and the cylinder storage yards. Historically, these locations have shown a facility-related dose. Locations 35, 40, and 72 did not indicate a facility-related dose. Location EDL-40 is south of Dyke Road (while the parcel is not readily accessible to the public, a member of the public at location EDL-40 would have received an external radiation effective dose of 1.1 mrem in 2024). Note that relocation of cylinders farther from the parcel in the future, if needed, would result in lower radiation doses within Leasing Parcel A. The Lessee's radiation protection program for a new nuclear facility would need to take into account the doses from the adjacent areas in addition to doses related to its operation.

7.5. DATA AND RISK SUMMARY

Based on the evaluation of the analytical data for Leasing Parcel A, there are indications that there have been releases of hazardous substances within Leasing Parcel A. Low concentrations of PCBs (three of twenty-eight subsurface soil samples with a maximum detection of 0.3 mg/kg) were detected in Leasing Parcel A soil. There also are active SWMUs/AOCs that are adjacent to the parcel that are to be further evaluated in future CERCLA projects to determine the extent of releases and whether remedial action is warranted.[6]

Future industrial use was evaluated for human health cancer risks and noncancer hazards. Surface soil was evaluated based on exposure to the long-term industrial worker and long-term outdoor worker. Subsurface soil was evaluated based on exposure to surface soil to the long-term outdoor worker and the shorter-term excavation worker. The results of the human health evaluation indicate that ELCRs are within or below the CERCLA acceptable risk range for surface soil and subsurface soil exposure under all exposure scenarios. Similarly, the evaluation of noncancer hazards indicate that exposure to surface and subsurface soil is unlikely to result in adverse noncancer health effects for all receptors under future industrial use. Exposure to groundwater is an incomplete pathway because Leasing Parcel A is within the Water Policy Area boundary.

The SLERA evaluated detected and nondetected analytes in surface soil against conservative NFA screening values. These values are selected for the protection of sensitive ecological receptors to ensure that impact to actual or potential wildlife habitat does not adversely affect ecological communities. The SLERA identified three detected site-related metals and two organics as COPECs. These two organics are

[6] The 2025 Site Management Plan proposes an Environmental Media OU that will combine cleanup actions for multiple environmental media areas (e.g., soils, surface water, groundwater, slabs, lagoons) into a single final decision (DOE 2024a).

recognized as common laboratory contaminants. Several nondetected analytes were also identified as COPECs. Because Leasing Parcel A is intended for industrial development and will not represent wildlife habitat, further evaluation of the COPECs was regarded as unnecessary. The findings of this leasing data package risk evaluation is that Leasing Parcel A is protective of human health and the environment for its intended future industrial land use.

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